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CONTENTS

NOTES ON A COWBIRD PARASITIZING A SONG SPARROW
Russell T. Norris 129

LIFE HISTORY OF THE BLUE-THROATED TOUCANET
Alexander F. Skutch 133

EASTWARD MIGRATION THROUGH THE GULF STATES
W. L. McAtee, Thomas D. Burleigh, George H. Lowery, Jr., and Herbert L. Stoddard 152

WEIGHT RECORDS FOR SOME ATLANTIC ALCIDAE R. A. Johnson 161

GENERAL NOTES 169

EDITORIAL 175

ORNITHOLOGICAL NEWS 176

REPORTS 177, 182

WILDLIFE CONSERVATION 178

WILSON ORNITHOLOGICAL CLUB LIBRARY 181

ORNITHOLOGICAL LITERATURE 183

THE WILSON BULLETIN

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PLATE 3

5:40 a.m., May 29, 1944 *Photo by Hal H. Harrison*

FEMALE COWBIRD ON SONG SPARROW NEST

THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

Published by the Wilson Ornithological Club

Vol. 56 SEPTEMBER, 1944 No. 3

NOTES ON A COWBIRD PARASITIZING A SONG SPARROW

BY RUSSELL T. NORRIS

THE parasitic habit of the Cowbirds (*Molothrus ater*) has been known since the earliest ornithologists began studying the avifauna of the western hemisphere, and much has been written concerning these birds and their hosts. Very little, however, has been recorded of their laying habits, and the published observations of egg removal and egg laying by the Cowbird are few and scattered. They are summarized in the following paper, with my own observations, made in May, 1944.

Friedmann (1929:185) saw a Cowbird go to a Robin's nest and deposit an egg just after he had examined the nest (at about 7:30 A.M.). Until 1937 this was the only record of anyone observing a nest both before and after a Cowbird had laid her egg. Then Hann (1937:201; 1941:215) observed the actual egg-laying on five occasions (each time at dawn). In two instances he obtained photographs of a Cowbird in an Oven-bird's nest.

Friedmann (1929:186) found no conclusive evidence that the Cowbird usually punctures or removes eggs of the host when depositing one of its own, but a few people have since observed this phenomenon, and some have seen the Cowbird eat the stolen egg. Roberts (1932:325) obtained a photograph of a female Cowbird taking an egg from the nest of a Scarlet Tanager, and also observed a Cowbird taking a Chipping Sparrow's egg from the nest. Blincoe (1935:158) saw a female Cowbird remove a Robin's egg from the nest (at about 5:30 P.M.). Nice (1937:157) observed a Cowbird taking a Song Sparrow's egg on two occasions (at 9:15 A.M. and 8:45 A.M., respectively). In the first instance the Cowbird ate both shell and contents; in the second, the bird flew away with the egg. Hann (1937:203) recorded three observations of a Cowbird taking an egg from the nest of an Oven-bird. The first occurred at 9:01 A.M., and the bird flew away with the egg. In the second instance, the bird ate contents and shell. In the third instance Hann (1941:Figure 1) obtained a fine photograph of the Cowbird removing the egg (at 9:10 A.M.).

Hann (1941:220) stated that the Cowbird usually removes an egg of the host during the forenoon of the day previous to its own laying, sometimes during the day of laying, rarely on the following day. Olson (1943:195), however, reported a Cowbird carrying away and eating a small egg, resembling that of a Song Sparrow, at 5:15 P.M., and there is in addition Blincoe's observation (cited above) of egg removal at 5:30 P.M. My own observations, which follow, agree with Hann's findings.

On May 28, 1944, I was working at my home in the village of Meridian about four miles west of Butler, Pennsylvania. Along the edge of the yard there is a strip of uncultivated land some 10 feet wide on which there is a rank growth of grass about 18 inches high and a few briers, forming excellent cover for ground-nesting songbirds.

At 9:45 A.M. (E.S.T.) I noticed a female Cowbird flying from this strip of grass with a small white object, apparently an egg, in her mouth. She flew away at an angle and alighted in a neighbor's garden 30 feet from the point where I had first observed her. She did not put the egg down immediately, and when I got a little closer she flew 70 feet farther off and again alighted. During the flight I could see that she was holding the egg with partly open beak, each mandible piercing the eggshell. This time I was careful not to approach too closely. She placed the egg upon the ground and began to break the shell with her bill. After maneuvering around the egg for some time and occasionally picking something up, she flew away. I went to the spot immediately, and all that remained of the egg was the moist spot where some of the contents had spilled onto the ground. I found no trace of the shell.

Shortly after this happened, I returned to the spot where I had first observed the Cowbird flying with the egg and began to search for the nest. I discovered a nest of the Song Sparrow (*Melospiza melodia*) built in the base of some grasses. It contained but one egg.

I anxiously awaited the coming of dawn on May 29, for Hann (1941:213) stated that the Cowbird lays very early in the morning, and I wanted to record the egg-laying procedure. At 3:00 A.M., Hal H. Harrison, President of the Audubon Society of Western Pennsylvania, and an expert photographer of birds, whom I had asked to assist me, arrived at my home and immediately began to set up his equipment. He removed enough grass from around the nest to enable him to see the bird when she arrived, and placed his camera on a tripod 24 inches from the nest, running a wire from the battery case of the photoflash equipment into the blind (placed about six feet from the nest) to a supplementary battery used to take the picture. The camera was loaded with a sheet of professional kodachrome film, and Harrison and I retired to the blind at 3:30 A.M.

It was quiet near the nest, but many Robins were singing all around, and shortly after 4:00 A.M., a Song Sparrow sang nearby. Just before 4:30 A.M., about 22 minutes before sunrise, we heard the sputtering

note of a Cowbird, and a few seconds later a female Cowbird alighted on the camera. After looking around cautiously, she flew to the ground at the base of the tripod and began to walk nervously toward the nest. As she reached the rim of the nest, she paused and carefully surveyed the surrounding territory, then stepped into the nest, and turned about several times. Finally she settled down, and Harrison pressed the button on the battery. As the flash went off, the Cowbird flushed. She had been on the nest no more than 15 seconds and had not deposited her egg. She flew a short distance into the garden and walked about there, watching, while Harrison removed the color film and replaced it with black and white. I felt sure that the Cowbird would return, since Hann (1941:220) found that Cowbirds are very persistent when they are attempting to deposit an egg.

At 4:38 A.M. I noticed a movement in the grass behind the nest, and after a few seconds the Cowbird appeared. She approached the nest warily, stepped up onto the rim, and paused there. Then she entered the nest and began to turn about as she had on her previous visit. After a few seconds, she stepped back onto the rim and looked around. She three times repeated this procedure of standing on the rim, then uneasily turning about in the nest. In one instance she mounted the rear rim and looked back into the grass. At approximately 4:40 A.M. she settled on the nest, and Harrison released the shutter. The Cowbird raised herself slightly but remained a few seconds before flying away. Upon examining the nest I found a fresh Cowbird egg. Undoubtedly the egg was being laid as the picture was taken.

The resulting black and white photograph, the third ever taken of a Cowbird on a nest, is presented with this paper (Plate 3). Hal Harrison's camera is a Zeiss Maximar, and it was loaded with Eastman Super XX film. The camera lens was exactly 24 inches from the nest, and the film was exposed for 1/100 of a second, with a stop of f. 11. The photoflash bulb used was a G. E. No. 5.

The Song Sparrow deposited her third egg sometime between 4:45 and 5:45 A.M., when I returned to the nest; her fourth egg on the morning of May 30; her fifth and last egg on May 31. On the morning of June 5, I visited the nest and found only four eggs—three belonging to the Song Sparrow, and the one Cowbird egg. The remainder of the incubation period, however, was completed without mishap, and on the morning of June 11 the Cowbird egg hatched. At 4:30 A.M. on June 12 one Song Sparrow egg had hatched, and by 10:30 A.M. on the same day a second sparrow egg hatched. The remaining sparrow egg did not hatch.

All went well with the two young sparrows and the Cowbird for the first few days. I visited the nest on the evening of June 17, and all three birds (six and seven days old) were still there and almost fully fledged, the Cowbird being about twice the size of the sparrows. But the next morning I found the nest empty, the horsehair lining lying on

the ground a few feet away. The three nestlings had apparently fallen prey to a prowling house cat during the night.

Summary

The published observations of egg-laying (six instances) and of egg-removal (eight instances) by the Cowbird (*Molothrus ater*) are summarized.

A female Cowbird carried off and ate a Song Sparrow egg at 9:45 A.M. on May 28, 1944.

She returned to the nest at 4:30 the next morning to deposit her egg.

She was frightened from the nest when a photograph was taken, but returned after eight minutes and was photographed on the nest while depositing her egg.

The Song Sparrow laid three more eggs (five in all, including the one removed by the Cowbird).

Two sparrows and the Cowbird hatched and were reared successfully until the Cowbird was seven, the sparrows, six days old, when the nest was destroyed by a predator.

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Box 847, Preston Laboratories, Butler, Pennsylvania

LIFE HISTORY OF THE BLUE-THROATED TOUCANET

BY ALEXANDER F. SKUTCH

IN spite of the general interest toucans have attracted since the days of Humboldt and even earlier, their habits, especially their manner of breeding, are little known. This is not surprising to one familiar with the difficulty of finding toucans' nests in the lowland forests and the unbelievably high proportion of nests in this environment that are destroyed by predatory creatures. Beebe (1917:183–209) described the nests, and the eggs or nestlings, of several species that breed in British Guiana; and Wagner (1944) recently published an account of the general habits, nest, and young of the Emerald Toucanet (*Aulacorhynchus prasinus*); but the only comprehensive life history of any toucan that has come to my attention is Van Tyne's "Life History of the Toucan *Ramphastos brevicarinatus*" (1929), which follows the nesting stages of the Rainbow-billed Toucan from egg laying through care of nestlings (until these were 36 days old, when they were destroyed by a predator). In Costa Rica, from July, 1937, to August, 1938, I observed the Blue-throated Toucanet (*Aulacorhynchus caeruleogularis*), which is the subject of the present study.

Range

Most of the toucans, particularly the largest species, dwell in the warm forests at low altitudes. In Central America the big toucans of the genus *Ramphastos*, and the middle-sized aracari toucans of the genus *Pteroglossus*, are still fairly abundant in various localities at 3,000 feet above sea-level, and are found occasionally as high as 4,000 feet, but scarcely ever above this level. At the higher elevations, the toucan family is represented only by the little green toucanets, of which two species occur in the Central American region.

The white-throated Emerald Toucanet dwells in the mountain forests from southern San Luis Potosí to northern Nicaragua. In Guatemala, where the bird is called "cucharón," I found it ranging vertically from heavy, subtropical forests, 3,500 feet above sea-level, to the temperate-zone woods of oaks, pines, and cypress, and even up to 10,000 feet above the sea. Van Tyne (1935:25) encountered toucanets of this species, although of a distinct race (*virescens*), among the lowland forests of El Petén, less than a thousand feet above sea-level.

In southern Central America, the Emerald Toucanet is replaced by the Blue-throated Toucanet, which is similar in appearance but has a blue instead of a white throat. It ranges from northern Costa Rica to Veragua, Panama. In the former republic it is quite generally known by the name "curré." I have met it on rare occasions as low as 3,000 feet on both the Caribbean and Pacific slopes of Costa Rica. Carriker (1910:577) states that it ranges down "to about 2500 feet on the Carib-

bean slope and perhaps a little lower on the Pacific." I doubt the second part of this statement, at least in so far as it may refer to southern Costa Rica; for during five years in the Basin of El General, I have only very seldom met the toucanet (and then only in the non-breeding season) as low as 3,000 feet, and I have never seen it in the forests about my house, 500 feet lower. As to the upper limit of the bird's altitudinal range, I found it at 6,200 feet in the Tablazo Mountains, and at 7,600 feet on the forested northern slopes of the Volcán Irazú. Carriker states that it occurs up to "at least 6000 feet." The absence of records of the toucanet at higher altitudes is to be explained, I believe, by the meager amount of ornithological work that has been done there. I should not be surprised to find it even at 10,000 feet in the oak forests on the Cordillera de Talamanca.

Description

The Blue-throated Toucanet, smallest of the Costa Rican toucans, is a bird about the size of a pigeon. Its plumage is chiefly green, in moderately bright shades, but not glittering or metallic. The throat and lower cheeks are blue; the under tail-coverts and the tips of the rectrices, cinnamon. The bill, though far smaller than those of the big lowland toucans, is huge in proportion to the body and is adorned with four colors. The greater part of the upper mandible is yellow with a slight greenish tinge, but its base and cutting edge, as well as the entire lower mandible, are black. There is a small patch of dull red at the base of the culmen. The bill is outlined, where it joins the head, by a broad white line. In the Blue-throated Toucanet the sexes are too similar in appearance and voice to be distinguished in the field.

General Habits

The toucanets travel in small, straggling flocks, which rarely consist of more than six or eight individuals. Not infrequently a lone bird is met. Although the mossy mountain forest is their true home, they wander through adjoining clearings where there are scattered trees, and often nest in such situations. They are restless, excitable birds, and scold a human watcher in tones which at times resemble the chatter of an angry squirrel. Their language, although varied, is nearly always unmelodious—throaty croakings and harsh rattles are the utterances one most frequently hears from them. But during their nesting season, they at times give voice to softer, more appealing sounds. Their food is like that of other toucans, consisting of a number of fruits and insects, varied now and then with the nestling of some other bird.

Study Area

My study of the nest-life of the Blue-throated Toucanet was made between July, 1937, and August, 1938, near Vara Blanca, on the northern slopes of the volcanic Cordillera Central of Costa Rica, at altitudes

between 5,200 and 5,600 feet. The house which I occupied stood amid pastures on the back of a narrow spur; but the pastures were bordered on three sides by heavy forests which dropped off abruptly into profound ravines, the one to the east a gorge about 500 feet deep, with the rushing Río Sarapiquí at its bottom. In my life histories of two neighbors of the Blue-throated Toucanet, the Quetzal and the Prong-billed Barbet (Skutch, 1944 *a* and *b*), I have described the climate of this storm-beaten, mist-shrouded region of high humidity, and its lofty forest giants burdened with an incredible profusion of epiphytes ranging in size from mosses and liverworts, through ferns, orchids, and aroids, to shrubs and even fair-sized trees.

Population

When I arrived at Vara Blanca in July, I found the toucanets exceedingly abundant, roaming in small flocks through the forests and shady pastures about the cottage. But thereafter they became increasingly rare, and in September and October I saw very few. It is not impossible that they had dropped down to slightly lower elevations; my own experience in El General, where I have seen them between 3,000 and 3,500 feet during the non-breeding season, would lend weight to this supposition, and Wagner (1944:68) describes marked altitudinal migrations which the Emerald Toucanet makes to escape the extremes of the rainy season in Chiapas. But in a country where there are scarcely any observers of birds, and travel, in most directions, is slow and exhausting, variations in the local abundance of a species are difficult to interpret. Possibly the Blue-throated Toucanets, without going elsewhere, had merely become quieter and more retiring during the wet and gloomy closing months of the year. I was absent from Vara Blanca during most of November and December, 1937, and during the intervals I spent there the weather was most unfavorable for bird-watching. During the opening months of 1938, however, the toucanets gradually became more noticeable among the local birds, and by March, when their breeding season approached, they were once more abundant and conspicuous.

The Nest

All toucans, so far as we have accurate information, nest in unlined cavities in trees. The biggest toucans (*Ramphastos*) are forced to hunt out spacious natural hollows, since none of their hole-carving bird-neighbors are large enough to provide for them. The middle-sized aracaris sometimes take advantage for nesting—and frequently for sleeping—of the holes excavated in dead trees by the biggest of the woodpeckers, such as the Guatemalan Ivory-bill (*Scapaneus guatemalensis*) and the Pileated Woodpecker (*Ceophloeus lineatus*). The nest-cavity of one of these woodpeckers will accommodate five slumbering adult Frantzius' Aracaris (*Pteroglossus frantzii*). The little toucanets find ample room for rearing a family even in nest holes as small

as those of the Hairy Woodpecker (*Dryobates villosus*), though they must enlarge the doorway. Wagner (1944:71) reports that the Emerald Toucanet nests in holes of the Green Woodpecker (*Piculus rubiginosus*) in Chiapas.

I have been unable to make an exhaustive search through the literature; but so far as I know, the only previous record of the nesting of the Blue-throated Toucanet is found in the following brief paragraph by Carriker (1910:577): "They breed in holes in trees, usually abandoned nests of *Campephilus* [*Scapaneus*] *guatemalensis buxans* or even *Chloronerpes yucatanensis* [=*Piculus rubiginosus*]. I have not seen the eggs, but nests examined at Juan Viñas in May each contained two young."

The six occupied nests of the Blue-throated Toucanet that I found at Vara Blanca were placed at heights ranging from 7 to about 90 feet above the ground. Five were in dead or dying trees standing in clearings with woodland near by; the sixth was in the woods near the edge of a clearing. In this connection it should be noted that, since the nests in the clearings were so much more readily found and so much more satisfactory for watching, I made no thorough search for others in the forest, where many were undoubtedly located. Apparently all six nests were in holes made by woodpeckers. The entrances were oval in form, considerably wider than high. The doorways of the three low nests ranged from 2⅛ to 2½ inches in width and from 1¾ to 2 inches in height. The one nest for which I have a measurement of internal capacity extended to a depth of 18½ inches below the lower edge of the doorway. In none of the accessible nests was there any lining; the eggs rested upon a layer of fine wood particles in the bottom.

My first nest was found on April 17, 1938. It was situated about 30 feet above the ground, in what appeared to be an old woodpecker hole in a barkless trunk of a cecropia, just within the edge of the forest, close by a pasture. Since the tree was unsafe to climb, I made no attempt to examine the interior of the nest; but I repeatedly saw the male and female replace each other in it, and judged that incubation had already begun. By May 6, the parents were taking food into this cavity for the nestlings.

Another nest was found on May 5, when three of the four eggs had just hatched, and the fourth was on the point of hatching. Since the incubation period (as subsequently determined) is about 16 days, and the eggs are laid on successive days, egg-laying in this nest must have begun about April 16. These two nests, then, indicate that in 1938 the nesting season at Vara Blanca began about the middle of April.

I was able to watch a third nest from the beginning of egg laying. I passed the morning of April 23 in my brown wigwam blind, which was set in the pathway that went round the ridge, with the pasture above it and the forest below. The purpose of my vigil was to record the activities of a Collared Redstart (*Myioborus torquatus*) in a nest

set in a niche in the mossy bank beside the pathway. On the steep slope above the bank stood an old decaying stub, in the side of which, only seven feet above the ground, was an old hole, possibly the work of the Green Woodpecker. A pair of toucanets were interested in the cavity; and while the warbler sat quietly on her eggs, I could watch their activities at close range.

From time to time during the morning, one of the toucanets went to cling before the doorway of the hole and look in; it would sometimes remain in this position for several minutes, sometimes for less than a minute. While one of the pair was at the woodpecker hole, the other sometimes clung to a vine that dangled from a leaning trunk close by. On these occasions, the toucanets uttered very soft, low, murmurous sounds quite different from their usual frog-like croaks and dry rattles. The murmurs were produced in the throat, with the bill quite closed, and when I first heard them I was puzzled to account for them, since I had never heard a toucanet deliver such sounds. They voiced these soft, amorous notes not only while one was at the hole, but also while they rested in the low trees above me.

When a squirrel climbed over the base of a large trunk near by, one of the toucanets flew at it with angry sounds and drove it away. But when the rodent, after retreating a short distance, returned to the same place, the toucanets ignored it. One of the birds alighted upon the ground, apparently to pick up something edible—the first time that I ever saw a toucan of any kind actually upon the ground.

In the afternoon, my vigil over, I brought a ladder and examined the hole in which the toucanets were interested. It had never been completed by the woodpecker that began it, and seemed far too shallow to serve as a nesting cavity for the toucanets. Apparently they had been trying to enlarge it by tearing out the extremely soft, decaying wood from its bottom. I found a good many large flakes on the ground below; and their freshness was evidence that they had just been removed, but I did not actually notice the toucans pull out any wood.

During the following days, I sometimes found one of the toucanets in this cavity, with its head in the doorway. There followed a period of about two weeks, during which I failed to see either bird at the hole. Then they returned, and on May 13 the first of a set of three eggs was laid. This was the nest that I chiefly studied during the period of incubation.

Toucanets do not always content themselves with old abandoned woodpecker holes such as this; sometimes they wrest newly completed nests from the industrious carpenters. At the end of April, I watched a pair of Hairy Woodpeckers taking turns at carving a hole, only 14 feet above the ground, in an old, decaying trunk that stood in the pasture hard by the forest. An oven-bird (*Pseudocolaptes lawrencii*) was nesting in a higher cavity in the same trunk. The wood was soft, and the woodpeckers (which had already lost an earlier, higher nest)

worked hard, rapidly enlarging their chamber. On the afternoon of April 30, when I went to visit the nests of the oven-bird and of the woodpeckers, to my great surprise a toucanet flew out of the latter. The following afternoon, a toucanet again emerged from this hole upon my approach. The woodpeckers could hardly have completed it before the larger, stronger birds took possession. Upon finding the toucanet in the woodpeckers' cavity the second time, I constructed a rustic ladder and approached the nest. I found that one of the toucanets had meanwhile returned to occupy the interior, but when I climbed up to look in with light and mirror, I failed to see the expected eggs on the bottom. It seemed that the invaders were keeping their captured citadel almost constantly garrisoned even in advance of laying their eggs, lest it be retaken in a counter attack by the rightful owners.

Although I did not actually witness the work, I have little doubt that the toucanets enlarged the woodpeckers' doorway, for it now measured 2⅛ inches in width by 1¾ inches in height. The entrance of a neighboring Hairy Woodpecker nest, still occupied by its makers, was only 1⅜ inches in width and 1½ inches high. Possibly the toucanets also somewhat enlarged the interior of the cavity, as they had in the old, low woodpecker hole that I had watched earlier. Although their great bills are not well adapted for wood-carving, they can tear away wood that has been thoroughly softened by decay.

The toucanets also attempt at times to capture the nest-cavities of the Prong-billed Barbet (*Dicrorhynchus frantzii*), which resemble those of woodpeckers with one important difference: barbets carve horizontally into the wood for several inches before turning downward, leaving around the tubular entranceway a greater thickness of wood than is usually found around the doorways of woodpeckers. These thick walls, coupled with the soundness of the trunks that the barbets select for their nests, sometimes at least, prove too strong for the clumsy carving tool of the toucanet. Fernando Gómez, my assistant, told me that he saw a pair of Blue-throated Toucanets tearing at the entrance of a barbet's nest containing eggs, while the owners flitted about and protested; but the pirates made so little headway that they soon gave up, leaving the barbets in possession.

The Eggs

The three nests that I could reach contained respectively four, four, and three, pure white eggs, laid in two of the nests at least, at one-day intervals. Wagner (1944:71) found two young in his nest of the Emerald Toucanet. Very little is known about the number of eggs laid by toucans, but four appears to be the maximum so far recorded. I have seen the eggs of only one other species of toucan, Frantzius' Aracari: the completed set consisted of two white eggs; in another, inaccessible, nest two young were fledged. In an unapproachable nest of the Collared Aracari (*Pteroglossus torquatus*) three young were reared. Van Tyne (1935:25) reports a nest of the same species from El Petén, containing

three eggs; and in British Guiana, Beebe (1917:199) found a nest of *P. aracari* with two young. Van Tyne (1929:24) records three nests of *Ramphastos brevicarinatus* with one, three, and four eggs; and Beebe (1917:192) found a set of two eggs of the Red-billed Toucan (*R. monilis*).

Since it was impossible to reach the eggs without making an opening in the wall of the chamber, which would have decreased the birds' chances of bringing forth a successful brood—and mine of completing my study—I did not remove the eggs for measurement, but viewed them in a small mirror placed in the top of the cavity, while the interior of the nest was illuminated with a small electric bulb let down on the end of a flexible cord, attached to the socket of a small electric torch. I observed the nestlings in the same fashion, never handling them. Such indirect examination of the young does not permit the study of certain points—the exact form of the heel-pads, for example—but it greatly increases the probability that the student will be able to follow the nestlings' development until normal nest-leaving age.

Incubation

The newly completed hole of the Hairy Woodpeckers captured by the toucanets at the end of April was occupied by one or the other member of the pair much of the time during the following days. Yet it was not used for sleeping even as late as the night of May 5. On May 6 the first egg was laid, and on that night one of the toucanets slept in the nest. The next day the second egg was laid, and the two eggs were apparently incubated more or less during the day, although two more were to be laid on the ensuing days. At the low nest on the bank, in which the completed set consisted of only three eggs, one of the parents was also found in the hole on several visits during the day the second egg was laid. But since a continuous watch was not kept, I do not know whether the eggs were kept covered for a substantial portion of the time before the sets were complete.

At my first nest, in the dead cecropia tree, I had seen that the male and female alternated in incubating the eggs. But I thought it would be of interest to make an actual schedule of the movements of a pair during incubation, and for this purpose I chose the low hole in the stub on the bank above the Collared Redstart's nest, which I had found on April 23. The toucanets were tardy in using this hole, and fully three weeks elapsed from the time I first watched them examining it and murmuring softly (April 23) until the first egg was laid there (May 13). By May 15 the set of three was complete, and on May 22—that is, about the middle of the incubation period—I devoted the morning to watching continuously from my wigwam, set in the pathway below the nest. The record follows:

5:25 A.M. Daybreak. I begin to watch the toucanets' nest.
5:37 A toucanet leaves the nest.

5:53 One enters, but leaves after a few seconds.
6:11 One enters.
6:41 It flies forth when a large dry leaf falls loudly to the ground in the woods near by.
6:53 One enters.
7:06 It leaves when it hears the voice of another toucanet (its mate?).
7:23 One enters.
8:29 It leaves.
8:33 One enters.
8:36 It leaves for no apparent cause.
8:50 One enters.
9:12 The mate flies up and clings before the doorway. The toucanet in the nest looks out. They utter low, rattling notes. The bird in the nest pushes past and flies away. The newcomer enters.
10:33 It looks out, leaves.
10:45 One enters.
11:35 It looks out, leaves.
11:36 One enters.
11:37 I depart.

Since I could not distinguish the sexes, it was not possible to determine the exact share of incubation taken by each sex; but the change-over observed at 9:12 proved that they took turns on the eggs, as the pair had done at the higher nest. The toucanets' sessions on the eggs varied from less than one minute to 81 minutes. As a rule, one member of the pair did not continue at its post until relieved by its mate, but the longest period that they left the nest unattended during the morning was 18 minutes. The average length of eight sessions on the eggs was 33.3 minutes; the average of eight periods of neglect was 11.9 minutes. During the first six hours of the day (5:37 to 11:37), counting from the early-morning departure of the bird which was apparently in charge of the nest during the night, the pair incubated a total of 266 minutes, and left the nest unattended a total of 94 minutes.

Thus the pair of toucanets kept their eggs covered only 73.9 per cent of the morning. When parents alternate on the nest, as for example, pigeons, trogons, woodpeckers, jacamars, and antbirds do, the eggs are as a rule kept almost or quite constantly covered, and the continuous sessions of each bird are usually very much longer than those recorded for the toucanets. But inconstant sitting seems typical of the toucan family. In two successive years, I made records of what I believed to be the same pair of Frantzius' Aracaris, and their schedules were very similar to those of the smaller toucanet, with (usually) short sessions and frequent periods of neglect, since one member of the pair did not continue on duty until its partner came to take over. The first year, the aracaris kept their eggs covered only 63.6 per cent of eight hours' observation; and the second year, 65.9 per cent of five hours. One of them took one long session of 102 minutes; but their other sessions were all shorter than the longest of the toucanets', the average for the first year being 25.6 minutes, for the second, 28.1 minutes.

Even the big Rainbow-billed Toucans show the same lack of pa-

tience in incubation. According to Van Tyne (1929:28), the sexes share this duty and relieve each other often. He found that "they were surprisingly restless and frequently stayed on the nest only twenty minutes to an hour before being relieved, or left without being relieved. They were clearly not alarmed about anything, but seemed merely to be bored with the unaccustomed monotony."

The way a bird incubates is determined to a large degree by its temperament, whether phlegmatic or mercurial. Watching a kingfisher perching quietly for hours above a waterway, digesting its latest catch, or a trogon resting upright with calm dignity among the forest boughs, one is soon convinced that these birds' long periods of immobility upon the eggs are entirely in keeping with their character. The restless toucans, however, rarely remain long in one spot, but are constantly flying from place to place and disporting with their fellows.

At the low nest in the stub on the bank where the three eggs were laid from May 13 to 15 inclusive, two hatched on May 30 and the third on May 31. The distribution of hatching lends weight to the conclusion, drawn from casual observations, that fairly constant incubation began with the laying of the second egg. The incubation period was 16 days (if we assume that the last egg laid was the last to hatch). I am not aware of any other determination of the incubation period of any species of toucan.

The Newly Hatched Young

The nestlings in this low nest died when about two weeks old, apparently as a result of the seepage of rain-water into the somewhat dilapidated chamber. The toucanets who stole the nest from the Hairy Woodpeckers also had bad luck; a few days after they began to incubate their four eggs, I found only broken shells in the bottom of the cavity. I believe that one of the weasels that lurked in the pasture grass was responsible for the destruction.

But the nest found on May 5 fared better. It was situated 15 feet above the ground, in a slender, rotting stump in the pasture, near the edge of the forest. To prevent the access of snakes and small mammals to the nest, I encircled the trunk, at a height of about six feet above the ground, with a metallic band 14 inches wide (a 5-gallon kerosene tin flattened out). This is the method commonly employed in tropical countries for the protection of the open-air hen-roosts, and I can recommend it to bird-watchers. Above this metal guard, which gave no purchase to the sharp claws of weasels, squirrels, or tayras, nor to the scales of serpents, the young toucanets remained safe in the low, exposed cavity through all the six weeks of their nest life.

When first examined on May 5, this nest contained three newly hatched toucanets, and one egg that did not hatch until the following day. The day-old toucanets bore so close a resemblance to the newly hatched nestlings of the Prong-billed Barbet which I was studying at

the same time, that had the two broods been mixed together, it would have required close scrutiny to separate them. They also resembled day-old woodpeckers and kingfishers, but not quite so closely. The young toucanets were pink-skinned, with no slightest trace of feathers. Their eyes were tightly closed, their bills short and somewhat flattened, with the lower mandible both longer and broader than the upper (as in the hole-nesters mentioned above and the nestlings of jacamars). The heel-pads, studded with high, prominent papillae, were grotesquely large in comparison with the tiny feet, which seemed mere appendages to the pads. During many days these pads were to bear a far larger portion of the young birds' weight than the toes themselves, and they would prevent abrasion of the heel-joint as the young toucanets shuffled about over the rough nest-floor. Wagner (1944:72) describes and figures the similar nestling of the Emerald Toucanet.

Whenever I looked in at them with electric light and mirror, I found the infant toucanets huddling close together on the floor, their long, scrawny necks usually interlocked. One of the four vanished before it was five days old; the remaining three often arranged themselves in a symmetrical pattern, each with the head of a nest-mate resting on its neck, and its own head supported on the neck of the other nest-mate. They were noisy, uttering a variety of little squeaks and squeals, especially if I lightly shook the nest trunk as though one of the parents had alighted upon it, returning with food. During their first days, they were brooded much by both parents. When one parent arrived with food, it clung beside the doorway until the other came out. I did not see both adults together in the hole at any time, and only one stayed with the nestlings during the night—not both parents, as with Frantzius' Aracaris, or a flock of five grown birds, as was the custom at a nest of Collared Aracaris I watched in Panama. I was never able to determine whether the toucanet which attended eggs and nestlings during the night was the female, as with most birds, or the male, as with woodpeckers and anis—or indeed, whether it was always the same parent.

At this low nest the parents were amazingly fearless, in striking contrast to toucans of other kinds that I have watched attend far higher nests. While studying a nest of the Collared Aracaris, situated a hundred feet above the ground in a huge tree amid the forests of Panama, I found it desirable to conceal myself; but the toucanets would enter their low hole with food while I stood close beside the rotting stub. When I wished to watch their activities for extended periods, I had only to seat myself on a stump at a convenient distance, with no attempt at concealment. In fact, most of the birds of this wild region would go about the business of their nests while I looked on from no great distance, and in plain view.

Food

From the age of a few days onwards, the nestling toucanets were nourished principally with fruits, small at first, gradually increasing in

size as the birds grew larger. The fruits were carried in the tips of the parents' great bills. After the young were full-grown, they received many of the big, hard, green fruits of a tall tree of the laurel family that grew near the nest. These measured about 1½ inches in length by ¾ inch in diameter, and had a thin, olive-colored flesh between the green skin and the single large seed. It must not have required many such fruits to fill up a nestling, but each could have yielded only a relatively small amount of nourishment, since the hard seed was indigestible. Rarely the parents came with articles so small that they were nearly or quite enclosed in the bill and hence difficult to distinguish. Some at least of these small morsels were insects. Several times I watched the adults try to catch insects on the wing, within the edge of the neighboring forest. At times their clumsy efforts seemed to be successful. Once a parent entered the hole with a naked passerine nestling, apparently a Cabanis' Thrush (see below).

The nestling toucanets received rather infrequent meals. During the first four hours of their forty-second day, food was brought to the two surviving nestlings only 16 times, making an average of one feeding for each nestling every half-hour. Although the young toucanets now spent considerable time looking out through their doorway, usually their parents pushed inside to feed them. But on several occasions the parents delivered the food while clinging in front of the entrance. Then I could see that, when smaller fruits were brought, in addition to the one held visibly in the tip of the bill, the parent brought to light others—usually two—that it had carried out of sight in its bill or mouth.

Early one morning, one of the parents arrived with one of the big lauraceous fruits described above. It entered the nest, and after a minute or so started to come out, but when halfway through the doorway it stuck and could go no farther. With its head and breast outside, and its big bill wide open in a ludicrous attitude, it struggled to squirm through, but in vain. Finally it regurgitated the big fruit, which it had apparently swallowed inside the nest when it found that the nestlings could not. Holding the fruit in its bill, as it had done upon entering, it now came through the doorway without difficulty, since it was considerably thinner. For about 25 minutes the toucanet continued to hold the big fruit, resting most of this time on the end of a low stub near the nest. At intervals it went to the nest to offer the fruit once more to a nestling; and finally, on the third offering, one of the young managed to swallow it—or so I infer, for the parent entered the nest with the fruit in its bill and came out without embarrassment, with no fruit visible. Later in the morning, a parent again took in a big fruit, which the nestlings were too full to swallow just then, got stuck in the doorway as it tried to come out, and was obliged to regurgitate the fruit in order to reduce its girth. This time, it carried away the fruit for its own consumption. These laughable incidents demonstrated that the doorway of the nest was barely large enough to allow the adult toucanets to pass

through. One could also see this plainly by watching from directly in front while the bird emerged. The form of the aperture, an oval wider than high, matched the shape of the bird's body and left no room to spare.

Nest Sanitation

Unlike the Frantzius' Aracaris that I had watched the preceding year and the Rainbow-billed Toucans studied by Van Tyne, the parent toucanets did not allow regurgitated indigestible seeds of the fruits they ate to accumulate in the nest. Whether or not they regurgitated such seeds while incubating it was impossible to see, but if so, they did not allow the mouth-castings to remain in the cavity. The parents also removed the empty shells within a day or two after the young hatched. The parents were always careful of sanitation, carrying away a large billful of waste on leaving the hole at daybreak, and again at intervals through the day. In this process all the loose chips on the floor of the nest were eventually removed. Only during the nestlings' last few days in the hole did the parents relax their attention to cleanliness and allow waste material to accumulate.

Growth of Nestlings

The young toucanets developed with extreme slowness—more slowly even than woodpeckers, kingfishers, and motmots, which for small birds have a notoriously long nest-life. They were two weeks old—an age at which many passerine birds are feathered and can fly—when with the mirror I detected the first traces of the feather sheaths. The difference in length between the two mandibles, which a few days earlier had still been conspicuous, now began to disappear. When the nestlings were 20 days old, the sheaths of their contour feathers were just beginning to break through, while those of the remiges had grown distinctly longer. The bill was now becoming somewhat like that of the adult toucanet in shape. It was not until May 30, when they were 25 days old, that I saw the nestlings with open eyelids, but the eyes still appeared cloudy, as though covered by a delicate membrane. By June 1, however, the eyes were both open and clear. The remiges and the contour feathers (except those of the head) were then beginning to break forth from the ends of their sheaths, though these had not yet become so long and conspicuous as those of kingfishers, motmots, jacamars, or lowland trogons. From their very first appearance, the feathers were green like those of the adults. At this age the nestlings were very noisy, uttering a variety of little grunts and squeals, so that their nursery reminded me of a piggery in miniature.

Even after the feathers began to expand at the ends of their sheaths, the young toucanets were long in acquiring a complete covering. On June 5, when they were a full month old, much of their skin was still exposed. By June 9, when they were 35 days of age, they were fully clad

(at least on their upper parts, which alone I could see), but their tails were still very stubby. Even now, they were not ready to venture forth into the world. They were 39 days old before I saw one with its head in the top of the chamber, looking out through the doorway. And still they lingered a few days longer.

Before they took flight, the young toucanets began to resemble their parents closely in plumage, even to their blue throats. But their eyes were still surrounded by rings of light-colored bare skin, and their bills, though gradually approaching adult dimensions, were still much smaller, and somewhat different in coloration. The upper mandible was much like that of the adults—black at the base and along the lower edge, elsewhere light yellow—but it lacked the red area at the base of the culmen. The lower mandible was black only along the cutting edge; elsewhere it was yellow clouded with black. The white line around the base of the bill, so conspicuous on the grown birds, was lacking in the young.

Departure of the Young

The two young toucanets left the nest on June 17 (at 43 days of age) before nine o'clock in the morning. Upon my arrival at that hour, I found one of them perching in a low tree at the edge of the woods, where the parents brought it food. It was nearly as big as they. It took a leaf in its bill, as though to test its edibility, but decided that it was not good to eat. I failed to find the other fledgling, which had apparently wandered farther into the woods.

A nestling period of 43 days is amazingly long for so small a bird, but other toucans remain in the nest as long, or longer. Wagner (1944: 73) estimates a nestling period of at least six weeks for the Emerald Toucanet. On Barro Colorado Island, in 1935, I watched a nest of the Collared Aracari situated high in a forest tree in a perfectly inaccessible position. The first of the young birds did not emerge until 44 days after I first saw food taken into the hole, and it is probable that I overlooked the first tiny morsels, and that the nestlings were already a few days old when I found evidence that they had hatched. Van Tyne (1929: 34) lost his brood of Rainbow-billed Toucans to some predacious animal when they were 36 days old, and was unable to determine the nestling period by direct observation. But from the known rate of growth of the young toucans, and the measurements of fledglings collected immediately after they left the nest, he estimated that if undisturbed they would have flown at the age of about 45 days. This is certainly a conservative estimate. In other families, as, for example, woodpeckers, kingfishers, and the Icteridae, the nestlings of big species depart later than those of small ones, and I think it likely, therefore, that these big toucans would remain in the nest at least five or six days longer than the toucanets or the aracaris.

Sleeping Habits

A single parent continued to sleep nightly with the nestling toucanets until they were at least 41 days old. I have no observations on this point for their next-to-last and final nights in the nest; unfortunately, I did not know exactly when they would depart. At the close of their first day among the trees, I watched for their return to the nest, but none of the family came near it, and thereafter the hole was abandoned. The same was true of a second, high, nest that I watched later. A slight litter of droppings in the bottom of the cavity at the time of the fledglings' departure was not subsequently removed by the parents.

The toucans' ways of sleeping are of considerable interest. Wagner (1944:69) apparently found the Emerald Toucanet roosting in holes in trees. Collared Aracaris and Frantzius' Aracaris regularly lodge in such holes, either natural cavities or abandoned nests of the larger woodpeckers. I have known as many as seven of the former, and five of the latter, to pass the night in the same hole. Male and female may sleep in the nest cavity before the eggs are laid; during the period of incubation, a single parent attends the eggs by night; but after the nestlings hatch, both parents sleep with them. Among Collared Aracaris, I have known as many as three other grown birds to take shelter with the parents and the nestlings. The newly departed fledglings return to sleep in the cavity where they were reared.

With these facts in mind at the time I studied the Blue-throated Toucanets, I made every effort to learn whether they used holes in trees as dormitories. Although I spent many an evening watching promising holes, I did not once see a toucanet enter one before the breeding season began. The birds would vanish through the foliage as darkness deepened, and I never succeeded in learning exactly where they roosted. The fact that the second parent did not sleep in the chosen nest before the eggs were laid, or spend the night with the nestlings, in the fashion of the aracaris, also weighs against the supposition that these toucanets use holes as dormitories. Even the parents' neglect, after the departure of the nestlings, to remove the last vestiges of excrement from the hole, suggests that the former nest is not employed as a dormitory—woodpeckers and barbets that continue to use the nest as a family dwelling after the young are a-wing, are careful to clean it thoroughly upon their exit. Of course, the young toucanets might have been led to take shelter in other cavities; but weighing all the evidence, my conclusion is that Blue-throated Toucanets do not lodge in holes, but rather roost among the foliage. The toucanets were no less abundant, and far more conspicuous, than the Prong-billed Barbets, the Hairy and the Green Woodpeckers, and the Allied Brownies (*Lepidocolaptes affinis*) among which they dwelt. During my year at Vara Blanca, I found several dormitories of each of these species, but not one of the toucanets.

Similarly, I have never been able to discover dormitories of the big toucans of the lowlands, the Rainbow-billed and Swainson's Toucans (*Ramphastos swainsonii*). I have often watched in the evening while these great, yellow-breasted birds sang their vespers among the tree-tops, hoping that I might at last follow their flight to their sleeping quarters. But usually they continue their monotonous singing until the light grows dim and practically all other diurnal birds have sunk into drowsy silence. Then they fly off through the dusk, baffling any attempt to keep them in view until they reach their destination. I am familiar with no definite record of their lodging in hollow trees, although Van Tyne (1929:20) surmises, largely from analogy with the aracaris, that they do so.

The Second Brood

Of the three accessible nests, two, as already recorded, were prematurely destroyed. If the parents in the third nest, whose nestlings departed on June 17, attempted a subsequent brood, I was unable to discover their second nest. Each of two pairs that nested in holes high out of reach reared, or tried to rear, two broods in the same cavity. One of these pairs incubated in April and fed nestlings during May; in late June they appeared to be incubating once more, and through much of July they were again taking food into the hole. At the other nest, 90 feet above ground, to which I gave only casual attention, the parents were bringing food on May 15 and again on July 6. The spread of these dates makes it practically certain that they were not feeding the same nestlings on both occasions.

It was unexpected to find these highland toucans raising two broods in a season. The pair of Frantzius' Aracaris that I watched for two years, at lower altitudes, lost young nestlings the first year, while in the second their eggs were destroyed. On neither occasion could I find evidence of a second attempt to nest (which, of course, would not have been a true second brood). Van Tyne (1929:34) concluded that the Rainbow-billed Toucan raised only a single brood in a season. In this connection, it is of interest that the Quetzals, neighbors of the Blue-throated Toucanets in the highland forests, quite generally reared second broods at Vara Blanca in 1938; but I have yet to find unequivocal evidence for a true second brood among the lowland trogons.

Relations with Other Birds; the Significance of the Bill

The boy who helped me to find nests saw a Blue-throated Toucanet fall prey to a White-throated Falcon (*Falco albigularis*), a hawk scarcely larger than its victim, but fierce out of all proportion to its size. Aside from this, I discovered no dangerous enemies of the adult toucanet. But if it has few enemies, it has likewise few friends. Its nest-robbing habits cause it to be intensely disliked by the small birds

among which it dwells. The Costa Rican Wood Pewees (*Myiochanes lugubris*) have a particular antipathy to the toucanets, and become greatly excited whenever one appears anywhere in the vicinity of their mossy nest.

I actually witnessed nest robbery by the toucanets on only one occasion. One afternoon in May, my attention was drawn by a Cabanis' Thrush (*Turdus plebejus*) which was very much upset. She perched on the ends of the branches of a wide-spreading, dense, shrub-like epiphyte attached high above the ground to the trunk of a lofty tree, where she nervously twitched her wings and uttered sharp, Robin-like calls of distress. She flew back and forth around the shrub in which she doubtless had her nest, darting at something that was screened from my view by the compact foliage and by the mist that shrouded the trees. Presently a toucanet flew out of the shrub, with the thrush in hot pursuit. I then went to the toucanets' nest where I had been observing the nestlings, and which was situated at no great distance from the scene of this episode. Presently one of the parent toucanets arrived there with the legs of a passerine nestling dangling from its bill—the body of the victim was largely concealed, but I assumed that it was a nestling taken from the thrush.

There has been a good deal of conjecture as to the significance of the huge, usually brightly colored, bills of the toucans. Some of the conflicting opinions are summarized by Van Tyne (1929:38). Belt (1888: 197) believed that the great size of the toucan's bill made it more effective as a weapon with which to defend itself, its eggs, and its young. He thought that the big bird, surrounded by the solid wooden walls of its nest-chamber, could ward off the attacks of monkeys, raccoons, opossums, and other small animals that might seek to force an entrance through the narrow doorway. My own experience with toucans of several kinds is essentially that of Van Tyne (1929:28), that they forsake their nest-holes upon the approach of real or fancied danger, making slight effort to defend them, either from within or without. Once at dawn, I surprised a kinkajou at the nest of the biggest toucan of Central America (*Ramphastos swainsonii*), high up in a great trunk at the edge of the forest. The toucan was not within, presenting its supposedly formidable beak to the foe, but was darting at the kinkajou from the outside. The quadruped scrambled down the trunk; but if it had not already devoured the eggs, it probably came back for them later; for soon after this the nest was abandoned.

Doubtless toucans do well to escape from the cavity when an arboreal mammal approaches. I do not believe that even Swainson's Toucan could face on equal terms such animals as the white-faced monkey, the coatimundi, the tayra, or even the kinkajou, all of which enjoy an occasional bird's egg or nestling. Even the little toucanet can put a squirrel to flight—as do many birds with far smaller bills—but for all its formidable appearance, the great bill of the toucan is of slight, hollow

construction, likely to be broken if put to too strenuous use. A Swainson's Toucan, with the terminal inch or two broken from its maxilla, has frequented this vicinity for the past two years. It appears to keep well nourished, but leads a solitary existence, apart from its fellows.

Van Tyne (1935:24) wrote: "It appears that length, as such, is the significant feature of its [the toucan's] bill." That the long bill brings within the toucan's reach edible objects that would otherwise be inaccessible to a bird so heavy and so clumsy upon the wing, such as fruits at the tips of weak and slender twigs, and eggs in nests attached to the drooping extremities of twigs, must be clear to anyone who has devoted much attention to the habits of these birds in their native forests. But it is obvious that a slender bill of the same length, soberly colored, would serve equally well for this purpose. As I watched the Blue-throated Toucanet despoiling the nest of the Cabanis' Thrush, while the owner flitted about in helpless indignation, it occurred to me that the great beak served yet another function; and during subsequent years, after watching Swainson's Toucans on their marauding expeditions, I have become convinced that this function is important to the toucans: I believe that the huge, boldly colored beak intimidates other birds and prevents their attacks. To any bird of the toucan's size, or smaller, this bill must seem indeed a formidable object. Bright coloration heightens the psychological effect that any object tends naturally to produce; it makes agreeable things more pleasing, but augments the fearsome aspect of objects that inspire dread. The bright colors of the toucan's bill doubtless make it appear more terrible to other birds than it would if more soberly tinted.

When a toucan alights near the nest of a small bird, the distressed owners merely dart back and forth above it, fearing to come within range of the terrifying bill, while the marauder snaps at them as they swoop past, sometimes voicing harsh, angry notes at the same time. Even the bigger and more aggressive flycatchers are afraid to attack a perching toucan. The Boat-billed Flycatcher (*Megarhynchus pitangua*), a giant in its family, has a strong antipathy to the Swainson's Toucan; a nesting flycatcher will leave eggs or young and fly a thousand feet to meet and worry a toucan that comes within sight of the nest; yet it dares not actually attack until the toucan begins to fly. On the wing, the toucan cannot defend its back, and the flycatcher pounces upon it to relieve its feelings by tearing out feathers. The Costa Rican Wood Pewee behaves similarly when the Blue-throated Toucanet comes near its nest.

Briefly, the length of the toucan's bill brings within reach food that might otherwise be inaccessible; its bulk and brightness make it appear more formidable than it actually is and serve to intimidate the birds whose nests the toucan loots. In these ways the immense beak is undoubtedly of use at the present day. But I do not, of course, claim that these uses are sufficient to explain its evolutionary development.

SUMMARY

A study was made of the Blue-throated Toucanet (*Aulacorhynchus caeruleogularis*) near Vara Blanca, Costa Rica, from July, 1937, to August, 1938.

This toucanet dwells in the mountain forests of Costa Rica and western Panama. Its recorded altitudinal range is from 2,500 to 7,600 feet above sea-level.

These birds nest in woodpecker holes and similar cavities, which they sometimes slightly enlarge. The doorway of the nest is barely large enough to permit the passage of the adults through it.

Six occupied nests were found; these were placed at heights ranging from 7 to 90 feet above the ground.

Even before the first egg was laid, one or the other member of a pair of toucanets spent much time by day in a newly carved hole they had stolen from Hairy Woodpeckers.

Of three accessible nests, two contained four eggs and the other, three eggs. The eggs were white, laid on successive days, and rested upon wood fragments in the bottom of the unlined cavity.

Incubation was carried on by both sexes. The toucanets were restless on the nest, often going off without awaiting relief, leaving the eggs uncovered.

At one nest the incubation period was 16 days.

The young are hatched blind, perfectly naked, and with the lower mandible both longer and broader than the upper. They are equipped with large heel-pads upon which they rest during the long nestling period.

Both parents brooded and fed the nestlings. Their food consisted chiefly of fruit, varied with small insects, and now and then the nestling of some other species.

The parents kept the nest perfectly clean until just before the young were ready to depart.

The nestlings developed with extreme slowness. Their eyes did not open until they were about 25 days old, and they were not completely clad with feathers until 35 days old.

One or the other of the parents stayed with the nestlings each night, at least until two days before nest-leaving.

The young toucanets left the nest when 43 days old, before 9 A.M. They now resembled their parents in plumage and color of bill, with certain minor differences, but their bills had not yet reached full adult size.

Two pairs reared two broods in a season.

Blue-throated Toucanets were not found sleeping in holes.

The Blue-throated Toucanet sometimes falls prey to the White-throated Falcon (*Falco albigularis*). Aside from this, the adult appears to have few harmful enemies.

The length of the toucan's bill is important in bringing within reach food that would otherwise be inaccessible. The bulk and bright coloration of the bill intimidate the small birds whose nests they despoil, thereby preventing attacks on the toucans by angry parents.

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EASTWARD MIGRATION THROUGH THE GULF STATES

BY W. L. MC ATEE, THOMAS D. BURLEIGH, GEORGE H. LOWERY, JR., AND HERBERT L. STODDARD

A VAST movement of birds from northwest to southeast is a recognized feature of the autumnal migration in North America. It brings to New England moderate numbers of Holboell's Grebe, Bonaparte's Gull, the Redhead, Canvasback, and the Lesser Scaup; to the middle Atlantic States, larger flights of those species, as well as the Baldpate, Shoveller, Black Tern, and the Western Palm Warbler; and to more southern states, the Gadwall, Western Sandpiper, Orange-crowned Warbler, Scissor-tailed Flycatcher, Arkansas Kingbird, Brewer's Blackbird, and Leconte's and Nelson's Sparrows. There are, for some species in the last group, a few scattered records in the Northern States (a result of occasional movement of individuals from southwest to northeast), but the regular group migrations of these birds in the Gulf States are predominantly eastward. Arkansas Kingbirds (*Tyrannus verticalis*) are sometimes common in Florida, and as many as 15 Scissor-tailed Flycatchers (*Muscivora forficata*) have been seen together on Key West (Greene, 1944:304).

Certain birds whose southeastern courses, if continued, would carry them south of the Gulf States, are deflected by the Gulf of Mexico, and follow it for varying distances, some to the very tip of Florida and even to the West Indies. They are joined by others moving more directly eastward and by a trickle of wanderers from Texas and (possibly) northern Mexico.

This flow across the Gulf States of birds of western and southwestern origin is sufficiently strong and regular to call for more general recognition. Little known as it still seems to be, this flight was, nevertheless, discussed by Robert Ridgway in 1874. Writing of the eastern and western forms of the Burrowing Owl, Aphelocoma Jay, Loggerhead Shrike, and the Dwarf Nuthatch, he said, "Not only with these stationary birds is there a near relation between the western region and Florida, but there is also a connection between them by the migratory ones, no less than five western species not found elsewhere in the Atlantic States, having been recorded from that peninsula" (1874:217).

Subsequent observations have added considerably to the evidence adduced by Ridgway. The published as well as numerous unpublished records, bearing on a Gulf Coast line of eastward flight, are summarized in Tables 1 and 2. It is fortunate for this presentation of the subject that for the avifaunas of three of the four states involved there are fairly recent books that can be used as key bibliographic sources. Information for Alabama is not so plentiful, because less intensive field work has been done there. For this reason, as well as on account of geographical propinquity, non-peninsular Florida and Alabama are herein considered as

a unit. The results of nearly 30 years' field investigations by Francis M. Weston in extreme western Florida, added to the data available from Alabama, place the combined areas on a level comparable with that of the well-worked regions of Louisiana, southern Mississippi, and Florida.

The state and regional lists used in compiling Table 1 are: for Louisiana, Oberholser (1938); for Alabama, Howell (1924); for Florida, Bailey (1925), and Howell (1932); for the West Indies, Bond (1936 and 1940). Mississippi records are based almost exclusively on the observations and collections of Burleigh, who is now preparing a manuscript, "The Bird Life of the Mississippi Gulf Coast," for publication. The Georgia records have been compiled from a number of sources, including the personal observations of Burleigh and Stoddard. Much additional information has been drawn from the records and extensive collections in the Louisiana State University Museum of Zoology, assembled largely since the publication of Oberholser's book (to which Lowery is now compiling a supplement), and from statements kindly furnished us by several ornithologists who have done intensive work in the regions under consideration. Among these, we are particularly obliged to Earle R. Greene, Robert Norris, and Francis M. Weston. The state lists mentioned may be consulted for the names of the original authorities as well as for details about the occurrence of many of the birds listed in our tables. Other sources, particularly publications issued since the comprehensive works cited, are listed at the end of this paper. For the purposes of this study, the occurrence of a species or subspecies in a given region is considered established only when at least one specimen of the form has been collected there.

A factor that may well be taken into consideration in appraising the significance of bird records such as form the basis of this paper, is the large number of observers in the North, particularly in the North Atlantic States, which makes bird stragglers there, as reported in the literature, seem more common than they are, while in the South, bird students are so few that their records may make comparatively common birds appear to be stragglers. To put the situation in other words, there might be a hundred times as many individuals of a given species in a southern area as in a comparable tract in the Northeast, yet due to the inverse ratio of observers, reports eventually finding their way into print might give just the opposite impression.

No problem has been more troublesome to us than that of deciding what to include in, and what to omit from, Table 1. Readers may wonder why they do not find certain forms listed, but in most cases we believe these will prove to be species that breed so far to the eastward that their representatives collected in the Gulf States could have reached that area by a southward movement with little or no eastward trend. The greater part of the breeding range may lie to the west or northwest, and the bulk of the migration may be eastward or southeastward; yet the fact that this is not true of all, counsels against inclusion of the

TABLE 1

BIRDS WHICH MIGRATE EASTWARD IN THE GULF STATES

Species	Louisiana	Mississippi	Alabama and non-peninsular Florida	Georgia	Peninsular Florida	West Indies
White Pelican (*Pelecanus erythrorhynchos*)	F	Occ.	F	R	F	R
Cinnamon Teal (*Querquedula c. cyanoptera*)	Occ.	—	—	—	R	—
Western Red-tailed Hawk (*Buteo jamaicensis calurus*)	Occ.	—	—	—	—	—
Fuertes' Red-tailed Hawk (*Buteo jamaicensis fuertesi*)	R	—	—	—	—	—
Texas Red-shouldered Hawk (*Buteo lineatus texanus*)	Occ.	—	—	—	—	—
Swainson's Hawk (*Buteo swainsoni*)	—	—	—	—	F	—
Sennett's White-tailed Hawk (*Buteo albicaudatus hypospodius*)	R	—	—	—	—	—
Harris's Hawk (*Parabuteo unicinctus harrisi*)	R	—	—	—	—	—
Western Snowy Plover (*Charadrius nivosus nivosus*)	F	Occ.	—	—	—	—
Mountain Plover (*Eupoda montana*)	—	—	—	—	R	—
Long-billed Curlew (*Numenius americanus*)	F	R	R	R	R	R
Western Willet (*Catoptrophorus semipalmatus inornatus*)	F	F	R	F	F	R
Long-billed Dowitcher (*Limnodromus griseus scolopaceus*)	F	—	R	Occ.	Occ.	—
Avocet (*Recurvirostra americana*)	R	—	—	R	R	Occ.
Franklin's Gull (*Larus pipixcan*)	Occ.	—	—	—	R	R
Mexican Ground Dove (*Columbigallina passerina pallescens*)	Occ.	Occ.	—	—	—	—
Inca Dove (*Scardafella inca inca*)	R	—	—	—	—	—
Groove-billed Ani (*Crotophaga sulcirostris sulcirostris*)	F	R	—	—	R	—
Western Burrowing Owl (*Speotyto cunicularia hypugaea*)	F	F	R	—	—	—
Howell's Nighthawk (*Chordeiles minor howelli*)	Occ.	R	—	—	—	—
Cherrie's Nighthawk (*Chordeiles minor aserriensis*)	Occ.	R	—	—	—	—
Western Nighthawk (*Chordeiles minor henryi*	R	—	—	—	—	—
Sennett's Nighthawk (*Chordeiles minor sennetti*)	R	—	—	—	—	—
Pacific Nighthawk (*Chordeiles minor hesperis*)	Occ.	—	—	—	—	—
Texas Nighthawk (*Chordeiles acutipennis texensis*)	R	—	—	—	—	—

TABLE 1 (*Continued*)

Species	Louisiana	Mississippi	Alabama and non-peninsular Florida	Georgia	Peninsular Florida	West Indies
Vaux's Swift (*Chaetura vauxi*)	Occ.	—	—	—	—	—
Rufous Hummingbird (*Selasphorus rufus*)	R	—	R	—	—	—
Vermilion Flycatcher (*Pyrocephalus rubinus mexicanus*)	F	R	F	—	—	—
Western Brown Thrasher (*Toxostoma rufa longicauda*)	Occ.	R	—	—	—	—
Palmer's Thrasher (*Toxostoma curvirostre palmeri*)	—	—	R	—	—	—
Sage Thrasher (*Oreoscoptes montanus*)	R	—	—	—	—	—
Mono Hermit Thrush (*Hylocichla guttata polionota*)	—	R	—	—	—	—
Pacific Pipit (*Anthus spinoletta pacificus*)	R	R	—	—	—	—
Sprague's Pipit (*Anthus spragueï*)	Occ.	R	—	R	Occ.	—
White-rumped Shrike (*Lanius ludovicianus excubitoroides*)	R	—	—	—	—	—
Alaska Yellow Warbler (*Dendroica aestiva rubiginosa*)	F	R	—	—	—	—
Hoover's Warbler (*Dendroica coronata hooveri*)	Occ.	Occ.	—	—	—	
Townsend's Warbler (*Dendroica townsendi*)	—	R	—	—	—	—
Northern Pileolated Warbler (*Wilsonia pusilla pileolata*)	—	R	—	—	—	—
Western Yellow-throat (*Geothlypis trichas occidentalis*	R	—	—	—	—	—
Gray Ovenbird (*Seiurus aurocapillus cinereus*)	R	R	—	—	—	—
British Columbia Water-thrush (*Seiurus noveboracensis limnaeus*)	F	Occ.	—	—	—	—
Rio Grande Meadowlark (*Sturnella magna hoopesi*)	R	—	—	—	—	—
Thick-billed Red-wing (*Agelaius phoeniceus fortis*)	R	—	—	—	—	—
Bullock's Oriole (*Icterus bullocki*)	R	—	—	—	—	—
Mesquite Great-tailed Grackle (*Cassidix mexicanus prosopidicola*)	F	—	—	—	—	—
Nevada Cowbird (*Molothrus ater artemisiae*)	Occ.	—	—	—	—	—
Western Tanager (*Piranga ludoviciana*)	R	R	—	—	—	—
Western Savannah Sparrow (*Passerculus sandwichensis anthinus*)	—	R	—	—	—	—

TABLE 1 (*Continued*)

Species	Louisiana	Mississippi	Alabama and non-peninsular Florida	Georgia	Peninsular Florida	West Indies
Nevada Savannah Sparrow (*Passerculus sandwichensis nevadensis*)	F	Occ.	—	—	—	—
Texas Seaside Sparrow (*Ammospiza maritima sennetti*)	—	—	R	—	—	—
Western Vesper Sparrow (*Pooecetes gramineus confinis*)	R	R	—	—	—	—
Western Lark Sparrow (*Chondestes grammacus strigatus*)	R	R	—	—	—	—
British Columbia Junco (*Junco hyemalis cismontanus*)	R	—	—	—	—	—
Gambel's Sparrow (*Zonotrichia leucophrys gambeli*)	—	R	—	—	—	—
Golden-crowned Sparrow (*Zonotrichia coronata*)	R	—	—	—	—	—
Dakota Song Sparrow (*Melospiza melodia juddi*)	R	R	—	R	—	—
Alaska Longspur (*Calcarius lapponicus alascensis* [>*lapponicus*])	Occ.	—	—	—	—	—

R = rare (a few records over a number of years); *Occ.* = occasional (several records); *F* = frequent (of regular occurrence in appreciable numbers). These designations represent our interpretation of the available data. Records of subspecies are based entirely on collected specimens which, except for *Calcarius lapponicus*, are all perfectly typical examples.

species in the table. Examples are the Yellow-headed Blackbird, Giant Redwing, Western Meadowlark, Western Henslow's Sparrow, Clay-colored Sparrow, Bell's Vireo, Willow Thrush, and Grinnell's Water-thrush.

Frederick C. Lincoln informs us that banding records show that the Canada Geese and Ring-necked Ducks that winter in Florida come from the Mississippi flyway, but they are, of course, not included in the table since both species breed east to the Atlantic coast.

There are a number of Gulf States records of species that occur to the west and southwest but also in the West Indies; and it is probable that at least some of these records are of west-to-east travelers; they are, however, excluded from the tables because the birds may reach the Gulf Coast from the Bahamas, Cuba, and Puerto Rico. The species thus eliminated are the Mexican Cormorant, the Masked Duck, Mexican Jacana, Black-necked Stilt, and Eastern White-winged Dove.

The Arkansas Kingbird and Scissor-tailed Flycatcher, mentioned in the opening paragraph of this paper, may be regarded as regular west-to-east travelers in the Gulf States, but the number of scattered records

for these two flycatchers over the eastern states in general is so great that it was thought inadvisable to include them in the table.

The frequency of occurrence of western birds eastward across the Gulf States is about that which on geographical grounds would be expected. Excluding breeding forms, there are 49 for Louisiana; 27 for Mississippi; 9 for Alabama and non-peninsular Florida; 7 for Georgia; 11 for peninsular Florida; and 5 for the West Indies (Table 1). Adding to the 54 migrant species (including the two flycatchers mentioned above) the 11 resident species probably derived from eastward wanderers (Table 2), we have 65 species, a significant fraction of the total North American avifauna (some 700 species, excluding stragglers). In spite of deficiencies in available information, the statement is probably justified that, measured by the number of kinds of birds that reach the various states, the west-east flight along the Gulf Coast is about three times as strong in Louisiana as it is in peninsular Florida, and that between these points, it decreases in strength more or less in proportion to its eastward extension.

TABLE 2

BIRDS OF PROBABLE WESTERN ORIGIN *
NOW RESIDENT IN THE GULF STATES (EAST OF TEXAS)

White-faced Glossy Ibis, *Plegadis guarauna* (La., Fla.)
Fulvous Tree-duck, *Dendrocygna bicolor helva* (La.)
Florida Duck, *Anas fulvigula fulvigula* (Fla.)
White-tailed Kite, *Elanus leucurus majusculus* (Fla.)
Audubon's Caracara, *Polyborus cheriway auduboni* (Fla.)
Attwater's Prairie Chicken, *Tympanuchus cupido attwateri* (La.)
Florida Crane, *Grus canadensis pratensis* (Miss., Ga., Fla.)
Eastern Willet, *Catoptrophorus s. semipalmatus* (Miss., Ala., Fla.)
Florida Burrowing Owl, *Speotyto cunicularia floridana* (Fla.)
Texas Horned Lark, *Otocoris alpestris giraudi* (La.)
Florida Jay, *Aphelocoma coerulescens* (Fla.)
Brown-headed Nuthatch, *Sitta pusilla* (La., Miss., Ala., Ga., Fla.)
Boat-tailed Grackle, *Cassidix mexicanus major* (La., Miss., Ala., Fla.)

The chief interest of this eastward flow of birds is its significance in relation to theories of bird distribution. As Ridgway pointed out in 1874, we have here a clue to the origin of eastern colonies of western birds. In contrast to Ridgway's four, we are now able to list ten, Floridian (as well as three Louisianian) forms of probable western derivation (Table 2). The proximate cause of their settling in the East seems to be their becoming acquainted with the country by participating in the west-east migration; the ultimate cause of the migration itself is, of course, unknown.

The fact that the connection between western and Gulf Coast avifaunas can be traced even through forms that are now locally extirpated,

* The shrike (*Lanius ludovicianus*), although included in Ridgway's list of western birds in Florida, is omitted from this table because we consider that it has a northern rather than a western origin.

or entirely extinct and known only as fossils, is also relevant. One of these is the Painted Vulture of Bartram (1773–74 [1943]: 165), which in all probability was a form of the species *Sarcoramphus papa* (Bonaparte, 1826–28; Lesson, 1831; Harper, 1936; McAtee, 1942).

The Pleistocene bird life of Florida (see Wetmore, 1940) was much like that now existing, but it included some notable strangers, and in nearly every case these were forms with western relationships. An observer then could have seen the Anhinga, the White Ibis, and most of the herons, egrets, and shoal-water ducks that are now present; also certain cranes and rails, the Coot, and Common Gallinule; various vultures, hawks and eagles (including the Osprey and Bald Eagle), the Bob-white, Wild Turkey, owls, crows, blackbirds, and grackles. The remains of small birds are not so susceptible of preservation in the fossil state (though they doubtless were in general of about the same species as we now find in Florida). The known Pleistocene birds with western affinities were mostly large birds and included the California Condor and the Whooping Crane, as well as two extinct raptors known both from California and from Florida fossil beds (*Teratornis merriami* and *Polyborus prelutosus prelutosus*).

These facts regarding the fossil avifauna of Florida are of the greatest interest in connection with the strong present-day tendency of western birds to push to the eastward along the Gulf of Mexico. This avian stream, evidently the source of the western element in the bird fauna of the Southeast, has been flowing for geologic time, but we are only beginning to realize its importance as a subject of ornithological inquiry.

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WEIGHT RECORDS FOR SOME ATLANTIC ALCIDAE

BY R. A. JOHNSON

THE need for weight records of birds to show individual and geographical variation as well as yearly, daily, sex and age variations has been pointed out by Nice (1938). Amadon (1943 *a* and *b*) has discussed the mathematical analysis of weight data, particularly the relationship of egg weight to body weight and body weight to "general size."

During the breeding seasons of 1931, 1934, and 1938, while working on a general study of the Murre in the Cape Whittle region, I recorded weights of the various species of Alcidae nesting there. This region, on the north shore of the Gulf of St. Lawrence, offers the greatest concentration of alcid breeding colonies on the Atlantic coast of North America. In the vicinity of Wolf Bay, a few miles west of the Cape, and on the St. Mary Islands, a few miles to the east, a great number of small colonies and a few large ones occupy the favorable breeding sites on the small and rocky offshore islands. They are here well isolated from the dogs and other enemies on the mainland; also, many of these islands are within a Government sanctuary system which is excellently patrolled, and I believe it is largely due to this system that the main populations have survived. Weight data on five species—Razor-billed Auk (*Alca torda*), Atlantic Murre (*Uria aalge*), Dovekie (*Plautus alle*), Black Guillemot (*Cepphus grylle*), and Atlantic Puffin (*Fratercula arctica*)—are presented in this report. An attempt was made to secure a series of weights for each species: of the eggs, of the growing young, and of the adults. It is not possible to handle one of these birds frequently (Johnson, 1938:162); in fact, one such disturbance early in the incubation period may cause the entire colony to abandon the site. The weights of the growing young are especially affected by repeated fright of the adult colony, and I took great care to minimize this disturbance factor. Hence, much time is required to secure an adequate series of representative weights. It will be long before we have sufficient data to determine accurately the average weight or daily weight rhythm of these sea birds, or their geographical, seasonal, and other variations, and although my data are in some instances very meagre, it seemed wise to make them available to other students at the present time.

The weight data presented here should be considered in relation to feeding and incubating habits of the birds. Baldwin and Kendeigh (1938:463), for example, found a daily rhythm in the weight of birds they investigated, "with the greatest weights being reached in the late afternoon or early evening and the lowest weights early in the morning." But this conclusion is based chiefly on data from passerine species, which feed largely on insects and seeds and thus accumulate their daily

food requirements gradually over a feeding time of considerable length. Whereas fish-eating birds, such as the Alcidae, by consuming one or more whole fish at a feeding, greatly alter their total weight in a short space of time. Also, the feeding day in northern latitudes is much longer than in middle latitudes and needs to be considered as a factor in the study of weights. (I have observed Murres, for example, feed young until 9:30 P.M. and resume feeding at 3:00 A.M. And it is possible that adults feed at sea during any hour of the night.) Furthermore, some species, like the Murre, often remain on the eggs during incubation for many hours and are sometimes without food for 15 to 24 hours.

In considering the growth of the young it is well to note that the young of Guillemots and Puffins (both burrow nesters) remain at the nest site much longer than the young of the related Auks and Murres (both surface nesters). When we have adequate data on a larger number of species, we may find that the growth curve of one burrow nesting species is more closely comparable with that of another burrow nesting species, whether of the same or a different family, than with that of a surface nesting species of the same family. I believe that, during the time the bird spends at the nest site, its environment, behavior patterns, and growth curve are closely correlated.

The factor of evaporation from eggs was ignored in this study and records made regardless of the stage of incubation. Addled eggs were readily detected and were discarded. In making the growth-study, young birds were marked by colored glass beads in different combinations, strung on soft copper wire and placed around the tarsus, where they remained until the young were old enough to carry an aluminum band. To secure the weight record, birds were placed in a cloth bag and weighed on scales sensitive to one tenth of a gram. The weight of the bag fluctuated in the field and had to be redetermined frequently. Except for some of the data relating to adult Murres and Black Guillemots, it was not possible to distinguish sexes. Table 2 appears to indicate a sex difference in the weight of Murres. Wing measurements are also included in the table for the Murre.

All the species studied were well started in the incubation period. The general condition of all birds weighed appeared to be good and was probably typical of the average breeding season. Food was abundant during June and July of 1934 and 1938, when this study was made. No evidence of disease was noted in any of the colonies. However, young birds in the Murre and Auk colonies were sometimes parasitized by ticks and lice. Because the present study was, for the most part, conducted within the confines of a Government sanctuary, it was not possible to record significant data relating to the role of internal parasites in relation to the health of these birds. So far as the adults are concerned, probably only healthy birds would be found in the breeding colonies. But the growth curve of young birds may at times be affected by such parasites. I have found downy young of the Red-breasted Merganser

taken in the region heavily infested with tapeworm (Johnson, 1937). I am certain that a weakened condition of many young birds of these colonial species is followed by a greater incidence of ticks and lice. It is not possible to show that such a weakened condition is always a result of starvation—internal parasites may be a factor. In the Murre, the care of young, so far as food is concerned, is certainly after the first few days, dependent upon a vigorous ceremonial response from the young. A weakened condition due to internal parasites would inhibit this response and thus perhaps lead to the neglect of the young by the parent birds.

Razor-billed Auk. Thirty-eight eggs of the Auk varied in weight from 73.5 grams to 100 grams (average: 85.4 grams). Two young Auks observed before their first feeding, weighed 57 and 60 grams. One juvenile, approximately three weeks old, leaving the nest site to go to the water (they do not return to the nest site as young birds), weighed 167 grams. The average weight of seven adult birds taken at the nest was 686 grams (extremes: 608 and 740 grams).

Figure 1. Young Murre and pipped egg.

Atlantic Murre. Fifteen eggs of the Murre varied in weight from 83 to 117 grams (average: 103.4 grams). One egg that weighed 113 grams when fresh lost 8 grams in weight in 10 days of incubation. (The incubation period, which I determined by giving Murre eggs to a domestic chicken to hatch, is 30 to 32 days.)

The true picture of the growth of the young Murre on the nest site is not easy to secure. Attempts to approach the breeding colonies more often than at three- to four-day intervals usually resulted in disturbing

TABLE 1
Weights (in grams) of Young Murres

	1931														1934							
Bird	A	O	B	N	C	D	E	F	G	L	H	I	J	K	P	Q	R	S	T	U	V	W
Egg wt.	89												93									
1 day																72	80	75	80	80	75	
2 days			101					102													98	
3 days	116.5										116		115.5					92	115	105		92
4 days				124											120				110			
5 days				110			119			126											102	
6 days	134							127		147					145			104		118		
7 days				dead	143						168		dead						120			
8 days	140					160				dead											101	
9 days							168								180			133		116		113
10 days								196			191											
11 days					154							176.2								123		
12 days	148					169	187				192				187							
13 days								185	186					179							dead	
14 days					156		183	210												132		
15 days		156				186					gone	222			187							
16 days														227								
17 days														220	195							
18 days		187			199		gone	gone	213			222		187								
19 days						188			162											135		
20 days					170				190			235		205								
21 days						190								gone	235							
22 days		gone				gone			182			gone			230							
23 days					141				gone						gone							

the adult birds to the extent that the young were either abandoned or so neglected that the data could not be considered representative (Johnson, 1938). But by selecting small colonies which could be approached somewhat under cover, a series of weights of young birds was secured (Table 1).

The records of individual young birds show that some lose weight a few days before leaving the nest site. Some lose weight at an earlier age, and these usually die at the nest. Emaciated young birds in a colony are generally the result of the adults abandoning the nests. If a young bird has reached the age of 16 to 18 days before such starvation begins, it usually responds to the calls of the adults at sea and breaks away from the nest site.

TABLE 2

ADULT BREEDING MURRES: WEIGHT DISTRIBUTION AND WING LENGTH

No. of birds	Weight (in grams)	Wing length		Sex, when known	
		range	average	male	female
1	1100–1125	.....	225.0	?	?
1	1075–1100	.....	....	1	0
1	1050–1075	.....	214.0	1	0
7	1025–1050	197–222	211.0	2	1
15	1000–1025	203–246	215.3	2	4
16	975–1000	208–218	213.4	5	3
13	950– 975	203–246	213.3	4	7
8	925– 950	210–218	215.3	3	0
13	900– 925	200–212	206.5	2	4
6	875– 900	203–216	208.3	?	?
3	850– 875	.....	....	1	?
4	825– 850	205–212	208.0	1	3
1	800– 825	.....	....	0	1

Table 2 gives the data on 89 adult breeding Murres taken at the nest during banding operations. During the 1938 season I discovered that the sexes could be distinguished in living Murres by an examination of the vent, and the sex, when known, is given in the table. The average weight of the 89 adults was 964.7 grams. The heaviest bird (a male not included in the table) weighed 1,150 grams; the lightest breeding bird, a female, weighed 815 grams.

Dovekie. In late fall and early winter many Dovekies come to these islands. Weights of eight wintering Dovekies, taken by Donald Osborne, of Harrington Harbor (Johnson, 1935), averaged 162.5 grams (extremes: 127 and 188 grams).

Black Guillemot. Twenty-three eggs of the Guillemot varied in weight from 42 grams to 65 grams (average: 49.2 grams). The difference in weight between the two eggs of single sets varied from .5

TABLE 3

WEIGHT DISTRIBUTION OF ADULT BLACK GUILLEMOTS

Weight range (in grams)	Graphic picture	Number of birds
470–480	★★	2
460–470	★	1
450–460		0
440–450	★★★	3
430–440	★★★★★	5
420–430	★★★★★★★★★★	10
410–420	★★★★★★★★★★★★	12
400–410	★★★★★★★	7
390–400	★★★★★★★★★★★★	12
380–390	★★★★★★★	7
370–380	★★★★	4
360–370	★★	2
350–360	★★	2
340–350	★	1
330–340		0
320–330		0
310–320	★	1

gram to 3 grams. Three newly-hatched birds had an average weight of 34.3 grams. Table 3 shows the weight distribution of 69 breeding adults. In 1938, I weighed seven Guillemots which were known to be four or more years of age. Their weights were: 437, 389, 358, 394.5, 404, 382, and 416 grams. The average for these seven birds was 398.5 grams, whereas the average weight for all breeding Guillemots was 419 grams.

TABLE 4

FLUCTUATIONS IN WEIGHT (IN GRAMS) OF INDIVIDUAL BLACK GUILLEMOTS WEIGHED ON DIFFERENT DAYS AND AT DIFFERENT HOURS OF THE DAY.

Interval between weighings	8 A.M.	10 A.M.	2 P.M.	4 P.M.	Difference
6 days	462			398	64.0
4 "	314	398.5			84.5
3 "	419		419		0
1 "		428			
		417			11.0
5 "	436	431	425		5.0
3 "	416				6.0
	403				13.0
3 "	380	394.5			14.5
2 "	396	406			10.0
11 "		416		415	1.0
5 "	399			399	0

Two birds known to be in their first breeding year weighed 414 and 417 grams, which is about the size of the average breeding bird of the species.

Table 4 gives data on daily and hourly fluctuations in the weight of individual Guillemots. The two weights (taken at 8:00 A.M. and 10:00 A.M. respectively) of the second bird recorded in the table show a difference of slightly over 26 per cent. This may have been due to an unusual quantity of food in the gullet at the second weighing, since no such extreme fluctuation was shown by the other birds recorded.

Atlantic Puffin. Thirty eggs of the Puffin varied in weight from 54.5 to 73.2 grams (average: 55.9 grams). One newly hatched young weighed 42 grams. Twenty-nine breeding birds of both sexes taken at the nest site varied in weight from 407 to 542 grams (average: 476.1 grams).

Summary

During the breeding seasons of 1931, 1934, and 1938, weight data were collected during field work on the north shore of the Gulf of St. Lawrence on four species of Alcidae: Razor-billed Auk (*Alca torda*), Atlantic Murre (*Uria aalge*), Black Guillemot (*Cepphus grylle*), and Atlantic Puffin (*Fratercula arctica*).

The average weight of 38 eggs of the Auk was 85.4 grams; for 15 eggs of the Murre, 103.4 grams; for 23 eggs of the Black Guillemot, 49.2 grams; for 30 eggs of the Puffin, 55.9 grams.

The average weight of adult breeding birds were as follows: Auk (7 adults), 686 grams; Murre (89 adults), 964.7 grams; Black Guillemot (69 adults), 419 grams; Puffin (29 adults), 476.1 grams.

Seven Black Guillemots known to be four or more years of age averaged 398.5 grams in weight, which is less than 5 per cent below the average of all adults weighed.

Adult banded Black Guillemots recaptured on different days and at different hours of the day showed great fluctuation in weight, obviously a reflection of their feeding habits. One bird showed a fluctuation of 26 per cent between the two weights listed.

The growth of young Murres is shown in relation to the length of time spent at the nest site. These young normally leave the nest between 18 and 24 days of age. They are likely to leave earlier if a food shortage comes after they are 14 days of age. If the shortage comes before that, the young die at the nest site.

The supply of food to the young is intimately tied up with feeding ceremony. When this relationship is not going well (possibly due to internal parasites weakening the young) the role of external parasites becomes significant to an undetermined degree.

Wing measurements of adult Murres showed no close correlation with weight.

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GENERAL NOTES

Summer occurrence of Holboell's Grebe in Ohio.—On the morning of August 9, 1943, a Holboell's Grebe (*Colymbus grisegena holböllii*) was seen feeding in one of the large ponds at State Fish Farm No. 1, Auglaize County, Ohio. The grebe remained on the pond four days, but was then shot as a fish predator. The Farm is near the eastern shore of Lake St. Marys, and the bird was probably first attracted to the larger body of water.

The specimen has been placed in the collection of the Ohio Division of Conservation and Natural Resources. It was a male, in molt, and its stomach contained one crayfish (probably *Orconectes i. immunis*), 6 cm. in length, and a mass of its own feathers. No signs of injury were present.

I am aware of no previous record of the species summering in Ohio, but according to Trautman ("Birds of Buckeye Lake, Ohio," 1940:156–157, and *in litt.*), it is apparently an uncommon transient throughout the state.—CLARENCE F. CLARK, *Ohio Division of Conservation and Natural Resources, St. Marys, Ohio.*

The American Egret breeding in Ohio.—The first sizable invasion of Ohio by American Egrets (*Casmerodius alba egretta*) occurred during the summer of 1930 (July 17 to October 14), when reports received of 755 individuals representing occurrences in 47 counties, indicated that probably at least 3,000 egrets reached the state (Hicks, *Wils. Bull.*, 43, 1931:268–281). Since then a considerable number of egrets has been present each summer, and in several years their numbers have approached or perhaps exceeded the 1930 population.

Until after 1930 there were no known occurrences of American Egrets during spring or early summer—nearly all records falling after July 10, with a few individuals tarrying into November or even early December. Each year since 1930 American Egrets have been reported during the breeding season (2 to 16 individuals in one to five localities). The earliest arrival date was March 16 (1934, at Grand Reservoir, Mercer County), although most of the birds have appeared in mid- or late April, or during May, and remained through June and July, when their identity was lost in the regular late summer invasion. During 13 of the last 14 years (1931–1944) I have recorded a total of 39 egrets in 9 localities, all before July 1. Including reports contributed by other observers, egrets seen during the breeding seasons totalled 64 (in 14 localities). These breeding season records were mostly in western and northern Ohio. They were confined to counties in which the other two large herons breed (there are 33 counties with a total of 61 Great Blue Heron colonies, and 15 counties with a total of 19 Black-crowned Night Heron colonies). Except for the breeding records listed below, association of egrets with these two herons has been very limited.

In 1939 a pair of American Egrets was reported by members of the Winnous Point Duck Club to be present along with Great Blue Herons in a sizable herony on Eagle Island in Sandusky Bay, Ottawa County. Accordingly I checked this colony the next year and on May 18, 1940, collected a set of 4 fresh eggs of the egret. These, now in the Ohio State Museum collection, represent the first Ohio breeding record. In 1941, two pairs of egrets were present, but only one nest was found. On the last visit of the season (July 5) this contained three large young. In 1942 no egrets were present at this colony, but another pair had a nest with four young in a small, newly established colony of Black-crowned Night Herons located near the south shore of Grand Reservoir, Mercer County.

Little publicity was given to these finds in the hope that freedom from disturbance would encourage more extensive nestings. A few egrets were present elsewhere in Ohio during the 1943 and 1944 breeding seasons, but difficulties of transportation have made it impossible to check on any new developments.—LAWRENCE E. HICKS, *Ohio State University, Columbus, Ohio.*

A mouse eaten by a Wood Duck.—A gizzard of a Wood Duck (*Aix sponsa*) sent to the U. S. Fish and Wildlife Service by Mrs. Albert F. Haspeslagh, of Galion, Ohio, in the fall of 1943, contained the partly digested remains of a white-footed mouse (*Peromyscus* sp.). The mouse, whose tail protruded from the gizzard, had apparently been swallowed whole. It made up about two-thirds of the gizzard's contents. The remaining third consisted of fragments from normal components of a Wood Duck's diet—pieces of hickory-nut shell (*Carya* sp.) and several grape seeds. The duck had been shot in late October, 1943, in Crawford County, Ohio.—A. L. Nelson, *U. S. Fish and Wildlife Service, Bowie, Maryland.*

The sex ratio in Wilson's Snipe.—The importance of a knowledge of the sex ratios of birds is well shown in the excellent summary recently published by Mayr (*Amer. Nat.*, 73, 1939:156–179), but ornithologists do not often have the opportunity to determine the sex of large numbers of birds, and even when such figures are secured their validity is often impaired by the operation of such factors as differential migration or unconscious selection by the observer. Museums contain large numbers of specimens of known sex, but the report of Pelseneer (*Mem. Acad.Roy.Belg.*, 8, 1926:3–258) showed the danger of depending too indiscriminately on museum series and threw the whole method into disrepute. The specimens in any good-sized museum collection of Henslow's Sparrow and the Clay-colored Sparrow furnish extreme examples of misleading series. They consist largely of males because the persistent singing of the males provides collectors with the only easy way of finding specimens.

On the other hand, it seems to me that the collector's sample might be a fair one in the case of certain species in which the plumage and the reaction to human intrusion are alike in the two sexes, and the number of specimens in museums is large enough to be statistically significant. For instance, David E. Davis (*Auk*, 57, 1940:179–218) found 401 males to 328 females in the museum specimens of the Smooth-billed Ani—a sex ratio which was corroborated by his own field data. The danger of depending on any but very large samples is well illustrated by the report of Imler and McMurry (*Wils. Bull.*, 51, 1939:244) on the sex ratio of ten 100-bird lots of Crows killed by bomb explosions in a winter roost in Oklahoma. The ratio among the 1,000 birds was 52.6 per cent males to 47.4 per cent females, but among the ten 100-bird lots the per cent of males varied from 41 to 65.

The sex ratio in shorebirds is of particular interest because of the remarkable diversity of breeding habits which we are beginning to find among the different species studied. In the case of the Painted Snipe, *Rostratula benghalensis* (Rostratulidae), Stuart Baker (Fauna Brit. India, Birds, 6, 1929:47) reports that males greatly outnumber the females and that the females display and fight for the males.

Little seems to be known about the breeding habits of the once common game bird, Wilson's Snipe (*Capella delicata*). Even the incubation habits are somewhat uncertain. Bent (*U. S. Nat. Mus. Bull. No.* 142, 1927:86) states that both sexes incubate but specifically cites only Philipp (*Canad.-Field Nat.*, 39, 1925:76), who says that three incubating birds collected were all males. Jourdain (in Witherby *et al.*, Handbook Brit. Birds, 4, 1940:200) says that in the closely related Common Snipe (*Capella g. gallinago*) of Great Britain only the female incubates.

The present survey summarizes the specimens of Wilson's Snipe in 23 public and private collections: Academy of Natural Sciences, Philadelphia; American Museum of Natural History; California Academy of Sciences; Carnegie Museum; Chicago Academy of Science; Chicago Natural History Museum (including the Conover Collection); Cleveland Museum of Natural History; Colorado Museum

of Natural History; Cornell University; Harvard, Museum of Comparative Zoology; Stanley G. Jewett; Los Angeles Museum; Ohio State Museum; Max M. Peet; Princeton Museum of Zoology; Royal Ontario Museum of Zoology; University of California at Los Angeles; University of California Museum of Vertebrate Zoology; University of Kansas Museum of Birds and Mammals; University of Michigan Museum of Zoology; University of Minnesota Museum of Natural History; U. S. Fish and Wildlife Service; U. S. National Museum. I recorded most of the specimens myself, but in a few cases the figures were prepared for me by the curators in charge. I am grateful for their assistance and for permission to use the figures from all of these collections.

These combined collections contained 1,163 specimens of Wilson's Snipe that had data on sex, locality, and date of collecting. The specimens were taken in every month of the year and in all parts of the range, from Alaska and northern Canada to the wintering grounds in Central and South America. With such a large sample made up of specimens taken at all seasons we are presumably justified in believing that we have eliminated any error that might come from differences in migration habits between the sexes. There are no sexual differences in plumage in the Wilson's Snipe nor, so far as we know, in habits or behavior, except at the height of the breeding season.

This series of 1,163 specimens consists of 678 males and 485 females, a ratio of 58.3 per cent males to 41.7 per cent females. It is interesting to note that only two of the 23 separate collections failed to show an excess of males, and these were two of the smallest (8 and 21 skins)—too small to provide a representative sample. When we analyze these 1,163 specimens by months (Table 1)

TABLE 1

SEX OF 1,163 WILSON'S SNIPE SPECIMENS IN MUSEUM COLLECTIONS

	♂	♀	Total		♂	♀	Total
January	49	36	85	July	31	16	47
February	36	20	56	August	18	24	42
March	48	30	78	September	64	53	117
April	105	90	195	October	98	93	191
May	61	47	108	November	72	41	113
June	33	11	44	December	63	24	87

we find that eleven of the twelve months show an excess of males; only August, with the smallest sample of any month, shows an excess of females. The only other evidence I can find of an excess of females in this species at any season is provided by manuscript data which A. William Schorger has generously permitted me to use. He sexed 143 Wilson's Snipe taken in the fall (mainly in October) near Madison, Wisconsin; 65 (45.5 per cent) were males, 78 (54.5 per cent) females. Thinking that this might indicate something unusual about the fall flight in eastern United States, I tabulated the October museum specimens from the northeastern states (east of the Mississippi and north of the Ohio rivers and north of the southern border of Pennsylvania), but the result was still an excess of males (48 males to 38 females).—JOSSELYN VAN TYNE, *University of Michigan Museum of Zoology, Ann Arbor, Michigan.*

History of a Mourning Dove nest.—A Western Mourning Dove (*Zenaidura macroura marginella*) built its nest behind the bronze grill over the entrance of Phipps Auditorium, The Colorado Museum of Natural History, in Denver, in the spring of 1941 and raised four broods during the year; the nest was again occupied and four broods raised in 1942; in 1943 three broods were raised; and in 1944 a crippled bird arrived early in May and raised one brood.

I made no attempt to keep close record, but in 1941 the first brood of young left the nest on May 28. Eggs appeared in the nest almost immediately afterwards, and the young left while I was on a field trip. The third family was well grown before my return; the two young departed on August 16 and 17. There were two eggs in the nest to start the fourth brood on August 20, and the young seemed nearly grown by September 12; they were gone three days later.

In 1942, eggs were first noted May 15, and the young left June 8; the second set of eggs was in place June 11, and one egg hatched June 25. Both young were gone by July 8. There were two more eggs in the nest on July 13 for the start of the third brood, and both young were on the wing August 6. The first egg of the fourth set was laid August 12, and the young were large on September 4.

An adult bird was seen on the nesting ledge of the Auditorium on April 2, 1943, to start the third season, but for some reason nesting was delayed, and the first set of young did not leave until the latter part of June. Two eggs were in the nest July 1, and the young of the second brood left July 24. The third set was observed July 28, and both eggs were hatched on August 10.

In 1944, a crippled bird was seen on the ledge on May 4; two eggs were in the nest May 19, and the young left 24 days later. We have no way of knowing whether the same birds used the nesting place, but 12 sets of young were raised in four years time. Incubation seemed to take between 12 and 14 days, and the young remained in the nest for a like period.—Alfred M. Bailey, *The Colorado Museum of Natural History, Denver, Colorado.*

Crow feeding from the surface of water.—On July 3, 1944, while we were on a high bluff overlooking Lake Michigan, about eight miles south of Saugatuck, Allegan County, Michigan, Robert Hale called my attention to a Crow, some 300 yards from shore, "diving" into the lake, evidently for food. When I turned to observe the bird, it was rising from the surface of the lake, with apparently some sort of food in the bill. The lake was calm at the time. Older summer residents stated that the Crow did this daily during the summer unless the lake was rough. We again observed this behavior on July 4, July 9, and July 16 during the early morning (and once late in the evening), always when the lake was calm or covered with long sweeping swells.

Crows (*Corvus brachyrhynchos*) were rather plentiful in the beech-oak woods on the bluff overlooking the lake, and we regularly observed a family group nearby. Apparently one or both of the parents made these flights out over the lake searching for dead fish or refuse. When these were observed the Crow would drop to the water, seize the food with its bill, then immediately rise to bring it back to the clamoring young in the bordering trees. The Crows usually managed to get the food by barely touching the surface of the water, but once one produced a considerable splash with its wings, immediately rising again into the air. Food was also taken from the water's edge, where it had been left by the incoming waves.—Lawrence H. Walkinshaw, *1703 Central Tower, Battle Creek, Michigan.*

Notes on the Arrow-headed Warbler.—There are two resident warblers on the Island of Jamaica, the familiar Yellow or Golden Warbler (*Dendroica petechia*) of the coastal mangroves, and the little known and odd-appearing Arrow-headed Warbler (*Dendroica pharetra*) of the mountain forest. The latter was discovered and described by Gosse, who obtained a single specimen on the summit of Bluefields Peak in western Jamaica. Subsequently it was found to range widely through the higher parts of Jamaica, but, except in the Blue Mountains, where it may be said to be fairly common, it is a rare bird.

This warbler is for the most part a silent bird. When not breeding it utters a weak *git*, readily distinguishable from the *chip* of migrant species. In the nesting

season, during May and June, one may hear the territorial song of the male, a rapidly uttered trill much like that of a Worm-eating Warbler (*Helmitheros vermivorus*). I also heard on one occasion its protracted, rather canary-like "whisper song." This was given by a male just prior to copulation, so that it would seem that song plays a part in courtship in this species. The "whisper song" of the Arrow-headed Warbler resembles that of the Prothonotary Warbler (*Protonotaria citrea*) as described by Brewster (*Bull. Nutt. Ornith. Club*, 3, 1878: 157), although the latter "is apparently uttered only while on the wing." I have also heard similar canary-like whisper songs—though never when the bird was in flight—from the Oven-bird (*Seiurus aurocapillus*), Yellow-throat (*Geothlypis t. trichas*), and Gray-crowned Palm Tanager (*Phaenicophilus poliocephalus coryi*). All were uttered by males during the nesting season and were so low as to be barely audible at a distance of 30 feet. The tanager sang while approaching the female with outstretched wings, but no female was seen near the Oven-bird or Yellow-throat.

Usually the Arrow-headed Warbler is found in, or about the edge of, humid mountain forest where it does not have to compete with the hosts of migrant warblers, which prefer the more open, sunnier parts of the island at lower elevations. During my exploration of the Blue Mountains in 1931, I found three nests of the Arrow-headed Warbler. These were placed at elevations of from 5 to 12 feet above the ground. Two were old, disused nests; the third, which contained two slightly incubated eggs when discovered on June 24, was described in my "Birds of the West Indies" (1936:315).—James Bond, *The Academy of Natural Sciences of Philadelphia.*

The Cardinal's period of dependency.—Gaps in a table on the development of young birds in the new Song Sparrow volume of Margaret M. Nice (*Trans. Linn. Soc. N.Y.*, 6, 1943:70) indicate that data are lacking on the age at which the Richmondeninae attain the power of flight, and independence.

Recent observation of color-banded young Cardinals (*Richmondena cardinalis*) showed weak but effectual flight on the day of nest-leaving, at about 10 days of age, the birds being able to keep in cover well above the ground; strong flight by the age of about 19 days, partial independence at about 38 days, complete independence at 45 days, and severance of family ties at 56 to 59 days. The findings in detail are:

♂ AW-0: Hatched June 16–18, 1942; banded in nest; next seen July 29, partly dependent; last seen fed by parent July 31, age 43–45 days; last seen with parent August 12, age 55–57 days.

♂ A-W2J: In nest with 2 other young, estimated age 4 days, found August 3, 1943; young left nest August 9, age about 10 days; A-W2J and at least one other flew weakly same day. A-W2J alone: flying strongly August 18, age about 19 days; first seen to forage September 6, age about 38 days; last seen to be fed by parent September 12, age about 44 days; last seen with parent September 26, age about 58 days.

The 45-day age of attaining independence thus determined for the Cardinal is a higher one than Mrs. Nice gives (p. 70) for any temperate zone passerine of comparable size, and is closely approached only by the "40 plus" of the Cinclidae. However, in view of her comment (p. 253) that with multiple-brooded birds the bond between parents and young may be longer than usual in the case of the final brood, and that "this is certainly true of Cardinals," I should add that I believe my 1942 nest to have been a final one, and know that the 1943 nest was that.

In the presence of a parent both of the juveniles that I kept under observation begged for food to the very end of their association, although during the final

12 or 14 days the begging was always futile. The way in which the parent's presence stimulated this begging was interestingly shown by AW-0 when he was 49–51 days old and had been independent for 6 days. He and his female parent flew into the same tree, then the adult went on deeper into the wood; while thus left alone the juvenile foraged and uttered *tsik* notes just like an adult's; when later the female flew back to a comparatively distant part of his tree he changed to the juvenile *tih* call; and when still later the parent went close to him, he not only gave the juvenile calls but intermittently fluttered his wings.—HERVEY BRACKBILL, *4608 Springdale Avenue, Baltimore 7, Maryland.*

Blue Grosbeak breeding in West Virginia.—On June 22, 1944, while accompanied by George H. Breiding, I found a pair of Blue Grosbeaks (*Guiraca c. caerulea*) three miles southwest of Shepherdstown, Jefferson County, in the eastern panhandle of West Virginia. The male sang repeatedly, and the female carried food, but it was only after considerable searching that I found the nest in a roadside fencerow. The nest, bulky and well built, was supported at a height of 30 inches by a clump of 40 green sprouts of osage-orange hedge. It contained two young about six days old.

The adults were left to re-nest, but we collected the two young and the nest to substantiate the record. One nestling, a male of 15.2 grams, is in the writer's collection; the other, a female of 14.8 grams, has been given to the West Virginia University Museum.

In West Virginia, as in most northern states, a number of questionable "sight records" of the Blue Grosbeak have been reported during the migration periods. But there are also the following reliable records of occurrences during the breeding season and late summer: (1) Monongalia County, during the summers of 1911 and 1923 (A. B. Brooks and Maurice Brooks); (2) a singing male during June, 1923, near Clifty, Fayette County (Maurice Brooks); (3) a male near Huntington, Cabell County, on May 29, 1925 (William Waldron, *Redstart*, 7, 1940:51); (4) an adult female at Bethany, Brooke County, July 6, 1929 (George M. Sutton, *Cardinal*, 3, 1933:121); (5) an adult male seen by Sutton and Karl Haller near Bethany, August 28, 1935 (*Auk*, 53, 1936:90); (6) a female at Jackson's Mill, Lewis County, August 28, 1936 (Roger T. Peterson); (7) a male at Oglebay Park, Ohio County, August 25, 1938 (I. B. Boggs, *Redstart*, 6, 1938:12); (8) a singing male seen on several occasions during May and June, 1944, at Jackson's Mill (Maurice Brooks).

The present record, however, according to Maurice Brooks, is the first specimen collected and the first nesting record in West Virginia.—LAWRENCE E. HICKS, *Ohio State University, Columbus, Ohio.*

Bachman's Sparrow taken in Michigan.—On April 29, 1944, Harold Mayfield and I collected a male Bachman's Sparrow (*Aimophila aestivalis bachmani*) near North Cape, Erie Township, Monroe County, Michigan. It was in rather poor condition, with practically no fat, but acted normally. The specimen has been given to the University of Michigan Museum of Zoology.

Bachman's Sparrow has never been reported before for Michigan. Maurice Brooks (*Wils. Bull.*, 50, 1938:86–109) described the recent northward extension of the range of this species in Ohio but mapped no records nearer Michigan than southern Wayne and Ashland counties. W. E. Saunders (*Canad. Field-Nat.*, 33, 1919:118) collected the first Canadian specimen on April 16, 1917, on Point Pelee.—LOUIS W. CAMPBELL, *4531 Walker Avenue, Toledo, Ohio.*

EDITORIAL

The Council of the Wilson Ornithological Club met in Put-in-Bay at the F. T. Stone Laboratory of Ohio State University on August 11 and 12. In spite of transportation difficulties there was a good attendance at the meeting. Officers, and committee chairmen reported on their work, and some very fruitful discussions followed. Plans were studied for an annual meeting of all the members next year, and preliminary work was undertaken on a much-needed revision of the Club's constitution. The proposed changes will be published in the December issue of the *Bulletin* and will be brought up for action at the 1945 annual meeting.

We continue to receive letters from members who do not know how to borrow, or even whether they may borrow from the Wilson Club Library. For the benefit of new members and of old members who may have missed the explanation published in the September 1943 *Bulletin* (p. 208) we should point out that all members of the Club are entitled to borrow publications from the Library. The University of Michigan will pay transportation one way. Members are expected to return borrowed publications as soon as they are through using them so that they may be available to others, but it has not yet been necessary to set any definite time limit on loans. Requests for loans or questions about the library holdings should be addressed to "Wilson Ornithological Club Library, Museum of Zoology, Ann Arbor, Michigan." A list of the Club's books was published in the September 1943 *Bulletin* and a second, supplementary list appears in the present issue (p. 181).

The Wilson Ornithological Club is indebted to its distinguished member and former president, Margaret M. Nice, for an important recent gift to the Library. The bare totals reported in the Bulletin will make it clear to members that this is numerically the largest single gift so far received, but the true importance of these accessions can be best understood by those who have seen them and noted the number of unusual and valuable publications included which are not found in most ornithological libraries. The book titles appear in our published lists; the pamphlets and periodicals will be listed later.

OBITUARY

J. Fletcher Street, well-known Philadelphia architect and ornithologist, died September 18, 1944, at the age of 64. He was the author of many scientific papers and of a book of more popular character, "Brief Bird Biographies." For the past two years he had been Treasurer of the American Ornithologists' Union.

E. C. Stuart Baker, foremost authority on the birds of India, died on April 16, 1944, in Upper Norwood, England, at the age of 79. In addition to his famous eight-volume work on the birds of British India, he published several books on Indian game birds and on the nesting habits of Indian birds. His last book, a notable study of "Cuckoo Problems," appeared in 1942.

William Lutley Sclater, distinguished British ornithologist, died in London June 6, 1944, in his eighty-first year. He edited *The Ibis* from 1913 to 1930 and wrote many important works on Old World birds, including the check-list of the birds of Africa. Students of American birds knew him best for his "History of the Birds of Colorado."

Ornithological News

After an association of 28 years with the Fish and Wildlife Service and its preceding agencies, W. B. Bell retired on August 1 as principal biologist and chief of the Division of Wildlife Research. His place has been taken by Clarence Cottam.

Several Canadian parties were actively engaged in faunal reconnaissance in northwestern Canada during the past summer. A. L. Rand, of the National Museum of Canada, headed a party which covered a route through the mountains between Yukon Territory and the Mackenzie River. C. H. D. Clarke, of the Lands, Parks and Forests Branch of the Department of Mines and Resources, accompanied by T. M. Shortt, of the Royal Ontario Museum of Zoology, carried on investigations in various parts of Yukon Territory. V. C. Wynne-Edwards, of McGill University, conducted faunal explorations along the Mackenzie River under the auspices of the Canadian Department of Fisheries.

Jean Delacour and William Beebe are revising the latter's monograph on the pheasants. It is expected that the new work, which will include Delacour's valuable experiences in collecting and rearing the rarer species, will not appear until some time after the war.

Harrison F. Lewis has succeeded Hoyes Lloyd as Superintendent of Wildlife Protection for Canada. Dr. Lewis, who for more than 20 years has been district officer in charge of migratory bird protection in Ontario and Quebec and is currently second vice-president of the Wilson Ornithological Club, thus takes full charge of the work by which a Canadian statute implements the Migratory Birds Treaty throughout the Dominion.

Oliver H. Hewitt, who obtained his doctoral degree at Cornell University last spring, has been made Chief Federal Migratory Bird Officer for Ontario and Quebec.

A. Starker Leopold of the Missouri Department of Conservation has been engaged by the Pan-American Union to make a two-year game survey of Mexico. The project is being financially supported by six American organizations. The Mexican government, which is actively cooperating, will aid Dr. Leopold by supplying two field assistants.

Publication date on Ernst Mayr's *Birds of the Southwest Pacific* (Macmillan, New York) has been set as November 7, 1944. This handbook will stress field identification and is intended especially for the use of the many servicemen now stationed in that region. New Guinea and the Bismarcks are considered outside the scope of the volume.

Margaret M. Nice and Alden H. Miller have been elected Foreign Members of the British Ornithologists' Union.

The University of Minnesota's Museum of Natural History completed a Swallow-tailed Kite habitat group during the past summer. The background, a view from a high bluff overlooking the broad Mississippi River bottomlands below Winona, was painted by F. L. Jaques on a grant to the Museum made by Major George M. Sutton in memory of his mother.

The Wildlife Society, at its annual meeting in Chicago last spring, voted *The Wild Turkey in Virginia* by H. S. Mosby and C. O. Handley the outstanding paper published in 1943 in the field of wildlife ecology and management.

James L. Peters has completed the manuscript of Volume 5 of his *Check List of the Birds of the World*. Twelve families, from the Trochilidae through the Bucerotidae, are covered. It will probably be published in 1945.

Upon the resignation of C. G. Abbot last June, Alexander Wetmore assumed the duties of Acting Secretary of the Smithsonian Institution on July 1.

REPORT OF THE NOMINATING COMMITTEE

For the third year the Wilson Ornithological Club must conduct its annual election of officers and members of the Council by mail. Your Committee offers the following nominations for 1945:

President: S. Charles Kendeigh
First Vice-president: Olin Sewall Pettingill, Jr.
Second Vice-president: Harrison F. Lewis
Secretary: Maurice Brooks
Treasurer: Milton B. Trautman
Councillors: Burt L. Monroe, Eugene P. Odum, Lawrence H. Walkinshaw

In addition to the slate offered above, any Active, Sustaining, or Life member of the Wilson Ornithological Club is eligible for office. You are urgently requested to mail your votes to the Secretary, whether you choose to support the slate given above, or whether you choose to write in the names of other eligible members for one or all of the offices.

Paul L. Errington
Lawrence E. Hicks, *Chairman*

AFFILIATED SOCIETIES

The Kentucky Ornithological Society was organized in Louisville on April 19, 1923, by Gordon Wilson, B. C. Bacon, and L. O. Pindar. In 1924 the Society held a program meeting in conjunction with the Kentucky Educational Association in Louisville, and at the same time arrangements were completed for affiliation with the Wilson Ornithological Club. The two-day spring meetings have become so popular among Kentucky teachers that since 1939 the cost of an outstanding lecturer on ornithology has been borne by the Educational Association. Annual fall meetings have been held since 1925 in various parts of the state.

In 1925 Gordon Wilson began publishing a quarterly journal, *The Kentucky Warbler*. This journal is now in its twentieth volume and has increased in size from 16 to 52 pages per year. Articles range from accounts of trips, field days, and bird experiences to carefully prepared analyses of bird habitats, distribution, and life histories.

In 1942 the Kentucky Junior Academy of Science became affiliated with the Kentucky Ornithological Society. By the offer of a prize the high school students who compose its membership are encouraged to study and write about birds. The prize paper is published in the *Kentucky Warbler*.

The officers for the current year are: President, H. B. Lovell; Vice-president, Victor K. Dodge; Secretary-treasurer, Helen Browning; Editor, Gordon Wilson.—Harvey B. Lovell, *President*.

WILDLIFE CONSERVATION

Grazing in National Parks

A bill (H.R. 5058) introduced in the United States Congress by Congressman Clair Engle of California on June 19, 1944, is intended: "To provide for the issuance of grazing permits for livestock in the national parks and monuments." The bill proposes that ". . . until the cessation of hostilities in the present war as determined by proclamation of the President or concurrent resolution of the Congress, and for a period of six months thereafter, all national parks and national monuments shall be open to grazing of livestock and permits shall be issued for grazing of livestock therein, any statute, policy, or regulation to the contrary notwithstanding. The Secretary of the Interior is hereby directed to issue such permits. The area in all national parks and monuments to be subject to grazing, the conditions under which such grazing is to occur, and the length of time each year of such grazing, shall be determined jointly by the Secretary of the Interior and the Secretary of Agriculture. It shall be the responsibility of the Secretary of Agriculture to represent the applicants for such grazing permits and the national interest in increased food production."

This proposal is contrary to the basic purposes and policies established by the Congress relative to the national parks and monuments. These policies were reiterated early in the war by the Secretary of the Interior, as follows: "The National Park Service will continue to hold grazing to a minimum and eventually eliminate it from the national parks. Grazing will not be extended or increased in the major scenic areas where it is now being carried on by permits inherited when the areas were established. Concessions authorizing grazing may be issued in the discretion of the Director, as a wartime emergency measure to meet critical demands for food and fiber in certain types of areas such as historical units wherein livestock may have historical significance and recreational areas where it does not interfere with human use."

It has been the policy of the National Park Service to permit stockmen who held privileges at the time of park establishment to continue grazing their stock in these areas until they retire from the business. This avoids undue hardship to individuals and provides an automatic method of eliminating livestock from park areas. Livestock grazing has been provided in 43 National Park areas, totaling 1,300,000 acres. It was estimated, in 1942, that these areas furnished forage to 20,000 cattle, 74,000 sheep, more than 1,500 horses and several thousand head of pack and saddle stock. Early in 1943 an increase of 20 per cent in cattle and 10 per cent in sheep grazing was authorized, as a contribution to the war effort, in several historic areas and marginal sections of certain parks.

This relaxation of normal standards apparently has not provided sufficient appeasement for some livestock interests, which continue to press for additional privileges. The proposed legislation is apparently aimed at providing these added privileges by directing that existing policies be discarded and the decision as to how much grazing should be permitted in the national parks be made jointly by the Secretary of the Interior and the Secretary of Agriculture. The Secretary of Agriculture is specifically directed to represent applicants for grazing permits.

The importance of increased food production is almost everywhere appreciated at this time, but there is danger that in our efforts to expedite food production irreparable damage may be done to certain national interests. This is particularly applicable to grazing in national parks.

Grazing means the selective elimination of interesting and valuable parts of the native flora and often an unnatural encouragement of thorny and unpalatable plants. It carries with it the threat of reduced cover for many native animals, increased foraging competition for our native herbivores, and long-term damage to shrubs and young trees. If America is to preserve these natural areas as a part

of its heritage, its great national parks and monuments should no more be turned into pastures for steers than the Lincoln Memorial be used as a garage for jeeps.

The first question that conservationists are likely to raise concerning this proposed legislation is whether it may be used as an entering wedge to secure continued grazing of national parks and monuments after war.—C.A.D.

Waterfowl

The Fish and Wildlife Service in a recent news release reported an increase of nearly 400 per cent in the population of game species of migratory waterfowl in North America during the past nine years. The estimated population is 125,350,000 birds. This is a considerable rise from the low point during the years 1934-35 when the population was estimated at approximately 27,000,000. The largest increase is reported in Mallards and Pintails. Third place is given to Scaups (Greater and Lesser together). Redheads, Baldpates, and Black Ducks are said to follow in that order. It is believed that Canvas-backs and Ruddy Ducks also increased but that Gadwalls, Green-winged and Blue-winged Teal, Ring-necked Ducks, and Shovellers decreased to some extent. Populations of geese are said to have exhibited no important changes.

The 1944 waterfowl regulations have been liberalized on the basis of this report and evidence of crop damage by ducks. The new regulations provide an open season of 80 days instead of the 70-day season of recent years. They permit also the taking of Redheads and Buffleheads in the legal bag of 10 ducks. An additional bag of 5 Mallards, Widgeons, and Pintails singly or in the aggregate may be taken. The daily bag limit on geese remains at 2 except that 4 Blue or Snow Geese may be taken singly or in the aggregate in the Pacific coast states. Except for Snow Geese in Idaho, 3 Montana counties, and on the Atlantic coast, these regulations apply elsewhere in the country. In issuing these regulations the Director of the Fish and Wildlife Service stated that ". . . the present liberalized bag is an effort to so scatter and control these species that agricultural losses may be cut down. It is purely a temporary expedient and the extra bag limit will be permitted only long enough to alleviate the present crop-damage situation."

Another regulation provides for a bag of 25 American and Red-breasted Mergansers singly or in the aggregate. This is due to reports that they are becoming so abundant as to constitute a menace to fish production.—C.A.D.

Conservation Education for Rural Leaders

The 4-H Club conservation camps that are held annually in 28 mid-western and eastern states constitute an educational program about which little is known outside of agricultural circles. The objective of these camps is to bring together for a week of training in conservation older farm boys and girls who show outstanding promise as leaders in their home communities. The present year marks the tenth anniversary of these camps.

The program presented varies in different states but is directed in all cases to give a well-rounded picture of conservation problems from a national, state, and local point of view. In the Ohio camp, for example, the subjects of human, soil, water, forest, wildlife, and habitat conservation are given major consideration. Elective activities offered are designed to give training in outdoor living. These include: safe use of firearms, swimming, archery, photography, bait casting, bird hikes, and nature study.

In recent years 35 such camps have regularly been held in 28 states. Between 3,500 and 4,000 rural youth attend them each year. The camps are directed by the agricultural extension service in the states and partly financed by Charles L. Horn of Minneapolis.—C.A.D.

Status of the Whooping Crane

The overlooked status of the Whooping Crane continues to be one of the most appalling aspects of bird protection today. Although migration counts are not an accurate index of population, we view with apprehension the trend in spring numbers of this species in Nebraska since 1934:

1934—134+	1939— 11
1935— 40±	1940— 31
1936— 82	1941— 3
1937— 64	1942— 3
1938— 49	1943— 1

During the past spring Whooping Cranes were reported as follows. On March 10 a flock of 15 seen by George Eggleson near Kearney, Nebraska. Additional records of presumably the same birds were made in the same region on March 12 (flock of 12) and April 2 (group of 3). In Saskatchewan 8 were seen on May 1, and 10 on May 11 by J. K. Wiebe at Amiens; 7 on May 13 by W. G. Karstad at Pontrilas; and one on May 10 by C. S. Francis at Torch River.

It is worth noting that the fine protection afforded Whooping Cranes on the Aransas National Wildlife Refuge in Texas has successfully sustained one remnant of the crane population, but this remnant has not significantly changed in numbers within the past 5 years. Philip A. DuMont, R. E. Griffith, and J. O. Stevenson of the U. S. Fish and Wildlife Service report these maximum numbers:

Winter	*Adults*	*Young of the year*
1938–39	10	4
1939–40	16	6
1940–41	21	5
1941–42	13	2
1942–43	15	4
1943–44	16	5

What practical help can be given the Whooping Crane at this eleventh hour? The species' breeding grounds are virtually unknown; its wintering areas are apparently limited. Before special protection can be rendered in the field, a careful survey and census of both regions are needed. Louisiana was surveyed last winter when Robert Smith of the Fish and Wildlife Service made an airplane check-up on waterfowl. Mexico will be covered during the next two years by A. S. Leopold. Texas, including the King Ranch, still needs a careful census. It can be made quickly and efficiently by plane. Because the crane is in some regions still famed for the value of its meat, refuges should—if possible—be set up wherever additional birds are found in winter. Possible, although not necessarily practical, is a special patrol like that provided for the Blue Goose to follow the crane on its migration. The flight of the crane north appears to be a leisurely one, and perhaps without particular danger; but its migrations south must be subject to the vagaries of early hunters and may involve hunting losses. In recent years Game Management Agent C. L. Licking, who has headquarters in Nebraska, has been instructed by the Fish and Wildlife Service to give this species special attention. Last spring Licking was handicapped by gasoline rationing and he could not follow the birds.

In Canada somewhat parallel measures could be undertaken. It would be worth some effort to ascertain whether nesting cranes are molested by Indians and to insure their safe flight over the guns of persons who shoot at every flying thing that is big.—A. M. Brooking and J. J. Hickey.

Wildlife Conservation Committee
Charles A. Dambach, *Chairman*

BOOKS: List 2

Books added to the Wilson Ornithological Club Library since the publication of List 1 (*Wilson Bulletin*, 55, No. 3, September, 1943: 209).

Baker, John H., The Audubon guide to attracting birds. 1941.

Baldwin, S. P., and S. C. Kendeigh, Physiology of the temperature of birds. 1932.

Barrows, W. B., The English Sparrow in North America. 1889.

Bennett, Logan J., The Blue-winged Teal. 1938.

Bent, A. C., Life histories of North American birds of prey. Part 1, 1937; Part 2, 1938.

Bent, A. C., Life histories of North American cuckoos, goatsuckers, hummingbirds, and their allies. 1940.

Blanchard, Barbara D., The White-crowned Sparrows (Zonotrichia leucophrys) of the Pacific seaboard: environment and annual cycle. 1941.

Bosschère, Jean de, Les paons et autres merveilles. 1933.

Brand, Albert R., More songs of wild birds. 1936.

Brandt, Herbert, Alaska bird trails. 1943.

Brewster, William, October farm. 1936.

Brewster, William, Concord river. 1937.

Brimont, Renné de, Les oiseaux. 1932.

Chapin, James P., The birds of the Belgian Congo. Part 2, 1939.

Delamain, Jacques, Portraits d'oiseaux. 1938.

Douglas, Norman, Birds and beasts of the Greek anthology. 1929.

Floericke, Kurt, Aussterbende Tiere. 1927.

Franke, Hans, Vogelruf und Vogelsang. 1933.

Friedmann, Herbert, Birds collected by the Childs Frick Expedition to Ethiopia and Kenya Colony. Part 1, 1930; Part 2, 1937.

Friedman, Herbert, The cowbirds. 1929.

Frieling, Heinrich, Liebes- und Brutleben der Vögel. 1940.

Guérin, G. L'effraye commune *Tyto alba alba* en Vendée. 1928.

Hochbaum, H. Albert, The Canvasback on a prairie marsh. 1944.

Howell, Arthur H., Birds of Alabama. 1928.

Jourdain, F. C. R., The birds of the Oxford district. 1934.

Lockley, R. M., Birds of the Green Belt. 1936.

Marples, George and Anne, Sea terns or sea swallows. 1934.

Martin, A. C., and F. M. Uhler, Food of game ducks in the United States and Canada. 1939.

Mitchell, Margaret H., The Passenger Pigeon in Ontario. 1935.

Mosby, H. S., and C. O. Handley, The Wild Turkey in Virginia. 1943.

Nice, Margaret M., Studies in the life history of the Song Sparrow, 2, 1943.

Nice, Margaret M., The watcher at the nest. 1939.

Nicholson, E. M., The art of bird watching. 1931.

Nicholson, E. M., and L. Koch, Songs of wild birds. 1936.

Rand, A. L., The distribution and habits of Madagascar birds. 1936.

Ridgway, Robert, The birds of North and Middle America, Part 8, 1919.

Ridgway, Robert, The humming birds. 1892.

Rowan, William, The riddle of migration. 1931.

Skinner, M. P., and J. W. Achorn, A guide to the winter birds of the North Carolina sandhills. 1928.

Taverner, P. A., Birds of western Canada. 1926.

Turner, E. L., Every garden a bird sanctuary. 1935.

Uexküll, J., und G. Kriszat, Streifzüge durch die Umwelten von Tieren und Menschen. 1934.

Voigt, U., Excursionsbuch zum Studium der Vogelstimmen. 1913.

Zedtwitz, Franz Xaver, Vogelkinder der Waikariffe. 1933.

The following gifts have been recently received. From:

Harry A. Beatty—1 reprint
Frank C. Bellrose, Jr.—1 pamphlet
Jean Delacour—1 reprint
Leon Kelso—5 journals and pamphlets
S. Charles Kendeigh—2 reprints
Amelia R. Laskey—2 reprints
F. Carlos Lehmann—1 reprint
Harold Mayfield—1 book
Margaret M. Nice—1,096 journals and reprints
Humphrey Olsen—354 journals and pamphlets
Miles D. Pirnie—1 book
Minnie B. Scotland—1 reprint
J. M. Winterbottom—1 reprint

To the Members of the Wilson Ornithological Club:

The Endowment Fund Committee wishes to bring to your attention once again the desirability of increasing the funded income of the Club. Under the capable leadership of its officers and council members the Club is carrying on as usual in spite of difficult conditions; but to enable it to be of even greater service in its field and to establish its finances on an even firmer base, its Endowment Fund should be increased.

The Club's outstanding contribution to ornithology is, of course, the publication of *The Wilson Bulletin*. Through this medium are presented the most recent observations and results of research in our field. In addition, through its reviews and bibliography the *Bulletin* helps members to know and evaluate the ornithological work being published elsewhere. It is highly desirable that after the war the *Bulletin* should be able to increase the number of printed pages per volume and to publish additional illustrations, including colored plates. Other activities of the Club could also well be expanded.

This calls for additional income, which in turn means an increase in endowment. Such additional endowment can come only from the following sources:

Life Memberships ($100.00)
Outright gifts
Bequests

The Committee urges your consideration of this matter. Whatever extra assistance you see fit to render at this time will aid in the furtherance of the aims and purposes of your Club.

Respectfully yours,
THE ENDOWMENT COMMITTEE
George B. Thorp, *Chairman*

ORNITHOLOGICAL LITERATURE

THE CANVASBACK ON A PRAIRIE MARSH. By H. Albert Hochbaum. Illustrated by the author. Amer. Wildl. Inst., Wash., D.C., 1944: 6 × 8⅝ in., xii + 201 pp., 19 pls. (1 col.). $3.00.

A notable book, characterized by careful observation, brilliant discoveries, and excellent writing. For the first time we now have an adequate account, based on both wild and captive birds, of territory in ducks.

"This report attempts to describe, in chronological sequence, what the Delta Station has learned since 1938 about the principal events of the duck summer. . . . the Canvasback is used as a 'base-datum,' and the other nine ducks which breed at Delta are compared with it" (Leopold, Pirnie, and Rowan in the Introduction).

A vivid description is given of the flora and fauna of the Delta Marsh, 36,000 acres in size, just south of Lake Manitoba, "a naturalist's paradise," "the *home* of wildfowl from the first break of ice in spring until ice comes again in autumn." Although the Canvasback (*Nyroca valisineria*) is the central figure in the book, comparisons are continually made with the many other nesting ducks of the Marsh. Courtship in all the ducks breeding in the Delta region falls into three periods: pre-nuptial, when the drakes display to a hen, which "chooses" one, and a pair is formed; a period of non-display (corresponding to the cessation of song after pair-formation in many passerines); nuptial courtship, when the territory is selected. The first period is the most intense; the last serves as mutual stimulation and a challenge to intruders.

"At the time the pair is ready to nest it takes title to a small water area of the breeding marsh—a pothole, the corner of a slough, or a portion of bay edge. Day after day, as long as drake and hen remain together as a pair, they may be found on this water area. Here the pair obtains most or all of its food. Here the drake and hen loaf and preen together, and here the drake waits for his hen while she is occupied at the nest. Here the drake serves the hen. This water area occupied by the pair is the 'territory'" (p. 56). The female selects the territory, and the nest is usually located beyond its borders. The author believes that the "primary function of territorial defense behavior in ducks is to establish isolation from sexually active birds of the same species during the copulation link of the reproductive cycle." He continues: "Territory in ducks is defense behavior plus a special plot of marsh. It is these together by which a drake, through his dominance, establishes his isolation. On his own small portion of this world with which he is familiar, and to which he has become conditioned, a drake is 'king of the mountain.' Beyond his own domain he is no longer a dominant individual" (p. 87).

Much valuable information is given on the nesting of the various ducks. "Injury feigning" is most intense in the Pintail, Blue-winged Teal, and Lesser Scaup; the Pintail and Teal perform as vigorously when their young are full-grown as when they are newly hatched (p. 106), whereas Canvasbacks and Redheads feign only with a newly hatched brood. Dogs and coyotes were observed to be lured away from the young by this protective behavior. When danger threatens Blue-winged Teal, the young dash to cover; under like circumstances, young of the diving ducks make for open water and dive.

Ducks recognize a species or an individual at great distances (as much as 300 yards) by sight, and also recognize their mates by voice. Adult captive ducks remembered each other for a month (pp. 36–38).

In the final chapter, on Management, one of the most interesting problems discussed is that of sex ratio. The excess of males in our waterfowl populations is most marked in the diving ducks, where the ratio averages 60:40 in most species—a very disturbing situation. All evidence points to a nearly balanced sex ratio at hatching, while the Delta bag tally showed "the kill of juveniles for all species was 1,502 males and 1,522 females, almost a perfect 50:50 sex ratio."

More adult females than males are shot on the breeding grounds, due to "their delayed wing molt which, under some conditions, makes the hen more vulnerable to gun pressure" (p. 151).

Three appendices are devoted to acknowledgements; scientific names of birds, plants, and mammals mentioned in the text; and a bibliography. A good index completes the volume. The numerous sketches by the author add to the value and charm of the publication. To the serious bird student, the "bird lover," the game manager, and the sportsman, the book will prove a mine of information on the biology and behavior of the prairie-nesting ducks.—Margaret M. Nice.

AMERICAN GAMEBIRDS: COLOR PLATES AND TEXT. By Louis Agassiz Fuertes. American Wildlife Institute, Investment Building, Washington 5, D.C., 1943: 14 x 12 in., 1 color pls., 5 pp. $2.50.

These colored plates and the accompanying brief text by the artist, apparently first published as a game calendar about 1906, are now being given wider circulation in a more permanent form by the American Wildlife Institute. The species treated are: Ruffed Grouse, Willow Ptarmigan, Upland Plover, Wild Turkey, Canvasback, Wood Duck, Mallard, Sandhill Crane, Bob-white, King Rail, and Canada Goose. At least two of these, the Wood Duck and Bob-white, are already familiar to bird students because of their publication in well known books by Forbush and by Roberts.

The paintings are, of course, not equal to the best work of Fuertes' later years, but they still rank high among modern bird paintings. Probably the Turkey and the Sandhill Crane will meet with the most general approval. The text contains some interestingly "dated" statements. The artist held small hope of any comeback of the Upland Plover, and he recommended protection of the Wood Duck from spring shooting because of the "imminent danger" of its "complete extinction."—J. Van Tyne.

THE ILLUSTRATED ENCYCLOPEDIA OF AMERICAN BIRDS. By Leon Augustus Hausman. Garden City Publishing Co., N.Y., 1944: 5½ × 8¼ in., xix + 541 pp., 707 illustrations. $1.98.

A more accurate title for this book would be "An Illustrated Dictionary of the Families and Species of North American Birds," for there are no articles on the various branches of ornithology such as would be necessarily included in any true encyclopedia. The publishers, rather than the author, are probably to be blamed for the quite unjustified claim that this book contains "everything you want to know about the birds of North America." However, by printing two columns of small type on each page a tremendous amount has been compressed into a moderate-sized book. For each bird in the A.O.U. Check-list the author gives a very brief description, a condensed statement of the range, and in most cases a short account of its habits. There is also a brief account of each of the 75 families of birds found in North America. Unfortunately, the condensation of many of the bird descriptions has been carried so far that they are quite useless for any purpose of identification.

The alphabetical system of arrangement is not without its drawbacks. Unless the beginner constantly refers to the systematic list at the back of the book, he is almost sure to acquire many wrong ideas and unfortunate mental associations. For example, he will find most of the Compsothlypidae grouped together, though a few, such as the Redstart, are, of course missing from that section. On the other hand, he will find there members of the Sylviidae such as the Willow Warbler and Grasshopper Warbler.

Apparently the only bird included which is not North American is Archaeopteryx—entered, strangely enough, under the name "Lizard-tailed Bird."

The black and white illustrations by Jacob Bates Abbott are surprisingly successful. In spite of their small size—most of them are two inches square or less—a large proportion of them will be quite useful to beginners in identifying birds. (In the absence of the text, however, a number of the pictures would defy identification by the most expert ornithologist.)

Also, for a book that purports to be a reference source, the text contains a disturbing number of errors. Many of the mistakes are merely misspelled words, but an occasional whole passage, such as the paragraphs on the ranges of Harlan's Hawk and Kirtland's Warbler, are entirely incorrect. One also finds Kennicott's Willow Warbler described in the text as "in reality a Thrush. . . . Family *Turdidae*," though in the systematic list it appears correctly under the Sylviidae.

The volume concludes with a synonymy of common names, and a bibliography of 88 books "useful to the layman in the study of birds."

If the title and the publisher's claims do not mislead people too much, the book may prove to be a very useful reference volume for a considerable public not reached by any other bird book.—J. Van Tyne.

NATURAL PRINCIPLES OF LAND USE. By Edward H. Graham. Oxford University Press, New York, 1944: 5½ × 8⅜ in., xiv + 274 pp., 32 pls., 8 figs. $3.50.

Dr. Graham here introduces a new technician in the "land management biologist" and presents an up-to-date review of progress in conservation on the land. Through his experience and travel as an ecologist for Carnegie Museum and more recently as chief of the biology division of the United States Soil Conservation Service, Graham has seen the growing need of applying ecological principles to conservation. This experience has led him to conclude that "it is the particular responsibility of a new technician—the land management biologist—to look to the relation between the management of rural land, whether it be cropland, pasture, range, woodland, or wildlife land, and the complex of plants and animals which attend such management. . . . His task is (1) to increase populations of species that are esteemed for their economic, recreational, aesthetic or other values, (2) to decrease populations of those species that are harmful to useful plants and animals or otherwise injurious, and (3) to maintain a reasonable balance between communities of living things and land use practices."

The function of this new technician is illustrated by selected examples of actual land management problems which are being met and solved daily by the application of ecological principles. Among the tools of the land management biologist are: a knowledge of succession and of indicator species, knowledge of cycles, recognition of growth forms and habitat niches, land use classification, census methods, food chains, and predator control.

Ecological principles of land management as they apply to farms, forests, range, wildlife, waters, exotics, and control methods, are treated in separate chapters. Throughout these chapters and elsewhere in the text is evidence of the material advances made in conservation theory and practice in the United States. These advances are illustrated in the 32 full-page plates of photographs which show conditions before and after conservation principles were applied. The pictures and their accompanying legends alone tell a well knit story of conservation progress and applied ecology. The freshness of the material and the recentness of the progress is illustrated by the bibliography. Of the more than 200 titles, only 13 per cent appeared before 1920, 12 per cent between 1920 and 1930, 75 per cent during the last 14 years. A list of common names used, with their scientific equivalents, and an index complete the book.

The vocabulary is non-technical, the style direct. The book should appeal to a wide range of readers including biologists, foresters, professional land use planners, and land owners, but especially to ecologists and wildlife managers.—Charles A. Dambach.

THE SOCIAL BEHAVIOR OF THE LAUGHING GULL. By G. K. Noble and M. Wurm. Annals N. Y. Acad. Sci., 45, art. 5, Dec., 1943:179–220. $.50.

This article is a well illustrated and relatively objective account of the social behavior of the Laughing Gull (*Larus atricilla*) as observed in the field at Muskeget Island, Massachusetts, and at Stone Harbor, New Jersey, as well as in a large flying-cage. A somewhat detailed description of the behavior of the Australian Silver Gull (*Larus novae-hollandiae*) as observed at the New York Zoological Park is included. Specific comparisons are made with the social behavior patterns of other species of gulls as recorded in the literature. Interpretation of the results of the study and preparation of the manuscript were carried out by the junior author following the death of Dr. Noble.

It is stated that "captive gulls exhibited the identical behavior pattern of free birds" (p. 208); this may be something of an overstatement, but it promises much for the validity of controlled studies made on birds under convenient laboratory conditions. Identification of sex of birds in the field was based mainly on behavior criteria. Aggressive-submissive behavior was found to play a very important role in sex recognition and pair formation and in territorial maintenance and defense. Numerical data are not presented on the relative frequency of various specific behavior patterns during different phases of the breeding cycle. Though the authors were able to mark a number of incubating individuals in the field, they were not able to establish conclusively the existence of a social hierarchy by which territorial relationships appeared to be modified. A more intensive and prolonged observation of fewer birds might settle this question.

One of the express motives in making this study was to determine the role of the nuptial dress of a black-headed species of gull. Unfortunately, birds whose head plumage the authors disturbed in the field were not seen again, and no extensive laboratory analysis of the problem seems to have been accomplished. With one possible exception, all of the displays which could be presumed to be emphasized by the black head (or vice versa) seem also to be found in white-headed species of gulls. The exception is the behavior described as "head flagging," which often accompanies erect posturing with smooth feathers in the Laughing Gull. But the exact significance of head flagging does not seem to be very clearly established, though it possibly helps to inhibit attack from other Laughing Gulls. The authors cite Kirkman's study (1937) of the Black-headed Gull (*Larus ridibundus*) and conclude that since the nuptial hood of this species is not employed by any special ceremony it is vestigial (p. 214). Nevertheless, the erect posturing of this species often involves "a sudden jerk of the beak to one side," an action which could be interpreted as a ceremony emphasized by the hood just as clearly (or unclearly) as the head flagging of the Laughing Gull could be interpreted as a ceremony emphasized by its black head. The omission of page numbers for references to Kirkman's and other books makes checking of comparisons a rather laborious task.

The authors conclude that communal display in Laughing Gulls serves "to provide the maximum number of contacts between many birds that are in an optimal physiological state for reproduction" (p. 217); they disagree with Darling's thesis (1938) that group display increases reproductive success in gulls by increasing general sexual activity and synchronization, on the grounds that "a variety of sexual behaviors . . . . performed by one pair provoked aggression in neighboring birds" (p. 209). No data are presented on fecundity or reproductive success in relation to size of groups, and it would seem that although Darling's evidence in itself was inadequate he had more data in favor of his hypothesis than Noble and Wurm have presented against it.

On the whole, this paper does not measure up to the previous excellent work by these authors on the Black-crowned Night Heron (*Auk*, 1938, 1942), but it is nevertheless a very valuable study.—Nicholas E. Collias.

AVES. By W. L. Sclater. Zoological Record, 79, Sect. 17, 1942. Zool. Soc. London, 1944. 6 *s.* (Obtainable from: Natural History Books, 6843 Hobart Avenue, Chicago 31, Ill. $1.55.)

William L. Sclater has again performed a great service to ornithologists by preparing the *Aves* section of the Zoological Record. For those unfamiliar with this invaluable index we should perhaps explain that it is an annual list of the ornithological titles—books, articles, and notes—published throughout the world. The list is fully cross-indexed taxonomically, geographically, and by 114 logically arranged subject headings.

The wartime retrenchment in printing and distribution of the results of scientific work is evident in the present list, which comprises only 1,076 titles—the smallest number for any peace-time year since 1925.—J. Van Tyne.

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